CTU Global Postdoc Fellowship

Czech Technical University in Prague now offers a new fellowship program, the CTU Global Postdoc Fellowship. This new and attractive two-year fellowship-program offers excellent researchers who have recently completed their PhD the chance to continue their research career at CTU. Fellows receive a two year fellowship and become members of a team led by a mentor.

The fellowship aims primarily at external international scientists who are currently conducting research abroad. Applicants must have completed their PhD within the last seven years (eg. 2015 or later). The fellowship aims at authors (co-authors) of two or more publications in a journal with IF. The mentor has a strong vote in the selection process.

The CTU Global Postdoc Fellowship is open to all topics listed later in this document. Researchers are invited to apply directly to the faculty/institute, see details below.

Applicants are advised to contact mentors for more details.

Application deadline is August 31. How to apply.

Shortcuts to topics/positions at faculties and institutes (click Topics/positions)	
Topic #1-x	Topics/positions available at the Faculty of Civil Engineering
Topic #2-x	Topics/positions available at the Faculty of Mechanical Engineering
Topic #3-x	Topics/positions available at the Faculty of Electrical Engineering
Topic #4-x	Topics/positions available at the Faculty of Nuclear Sciences and Physical Engineering
Topic #5-x	Topics/positions available at the Faculty of Architecture
Topic #6-x	Topics/positions available at the Faculty of Transportation Sciences
Topic #7-x	Topics/positions available at the Faculty of Biomedical Engineering
Topic #8-x	Topics/positions available at the Faculty of Information Technology
Topic #9-x	Topics/positions available at the Klokner Institute
Topic #10-x	Topics/positions available at the Masaryk Institute of Advanced Studies
Topic #11-x	Topics/positions available at the Institute of Experimental and Applied Physics
Topic #12-x	Topics/positions available at the Czech Institute of Informatics, Robotics and Cybernetics

Document version 1.3. Latest version of this document as well as latest information can be found at international.cvut.cz/postdoc

CTU Global Postdoc Fellowship

Topics/positions available at the

Faculty of Civil Engineering.

Applications should be sent to: lenka.kubickova@fsv.cvut.cz

CTU Global Postdoc Fellowship

Research topic #1-1

1 Topic	Transparent adhesive bonding for load bearing structural glass elements with respect to ageing and elevated temperature
2 Link to topic / project page[6]	https://ocel-drevo.fsv.cvut.cz/eliasova/projects/
3 Short description of topic[7]	Glass load-bearing structural elements are currently used more and more often, but due to the brittle fracture of glass, it is necessary to design these structures with sufficient reliability. Therefore, it is necessary to pay attention to the joints and construction details. Adhesive joints have a number of advantages over mechanical connectors commonly used in construction. Adhesives can provide more uniform stress distribution along the connection, it does not weaken the bonded material and eliminates thermal bridges. The project is focused on the treatment of the glass surface with electric plasma to improve the adhesion at elevated temperature with respect to ageing of adhesive bonding. Finally, full scale experiments of glass beams with adhesive joints will be prepared for selected adhesives to verify the mechanical behaviour of adhesive joints in real structural elements. An adhesive joint will be created in the mid-span of the beam using one of the tested transparent adhesive.
4 Description of ideal candidate[8]	The candidate for the position should have completed Ph.D. and should have published at least two papers in a journal with impact factor. The candidate should have knowledge in the field of structural design in civil engineering and experience with the use of software for numerical modeling using FEM, preferably ANSYS or ABAQUS.

Mentor

Martina Eliášová	Faculty of Civil Engineering	Department of Steel and Timber Structures	eliasova@fsv.cvut.cz

Salary: CZK 61 820 per month

CTU Global Postdoc Fellowship

Research topic #1-2

1 Topic	Quasicontinuum modeling of lattice structures and metamaterials
2 Link to topic / project page[6]	https://bit.ly/3ufgo1y
3 Short description of topic[7]	Within this project, the candidate will develop simulation techniques and tools for large lattice and beam networks with applications in the modeling of stiff and soft materials and metamaterials. The unifying approach will be that of the variationally-based quasicontinuum method developed by Rokoš and co-workers, which we will extend by (1) robust arc-length-type control strategies and finite-strain beam formulations to model (2) two-dimensional pattern formation in soft porous metamaterials and (3) out-of-plane patterning of soft textured surfaces. Besides, the new arc-length formulation holds notable potential for other numerical schemes, such as the finite element method, and in modeling of fracture and damage. The project will be conducted in collaboration with Ondřej Rokoš, an Assistant Professor at the Department of Mechanical Engineering, Eindhoven University of Technology, the Netherlands, and Milan Jirásek, a Full Professor at the host institution.
4 Description of ideal candidate[8]	An ideal candidate for this position will have proven experience in • Modeling of inelastic materials based on incremental energy minimization, • Computational mechanics of materials and structures, • Quasicontinuum or computational homogenization methods (or related techniques) and their applications to soft metamaterials, • Code development skills, preferably in MATLAB, C++, or a related programming language.

Mentor

Jan Zeman	Faculty of Civil Engineering	Department of Mechanics	Jan.zeman@cvut.cz

Salary: CZK 64 000 per month

CTU Global Postdoc Fellowship

Research topic #1-3

1 Topic	Generative design of structural members and joints with component based finite elements
2 Link to topic / project page[6]	Trend Advanced design of structural joints/members by machine learning TAČR FW01010392
3 Short description of topic[7]	Generative design of structural members and joints with component-based finite elements Structures exposed to earthquakes are designed for two levels of resistance high and medium. In practice, load-bearing steel structures are approximately prepared to dissipate energy in beams only. By verifying the full load-bearing capacity of joints and columns, capacity design, the structure is solved by the Lateral force method or Modal spectral analysis. Significant structures are designed for dynamic stresses for given load spectra Nonlinear static analysis or Nonlinear time-history analysis. The energy dissipation in the joints is verified experimentally or pre-qualified joints are prepared. The Component Method or the Finite Element Method with Components is prepared for pre-qualified joints. For dynamic stresses, approximate four-parameter relationships are currently used for modelling joints. The proposed Theses will use the finite element method with components equipped by Generative optimization, which will allow the significantly more reliable automatic design of members and pre-qualified joints exposed to seismic loading. The individual phases of the project, in which it is necessary to deal with the design of joints, will be studied and the impacts of different levels of BIM implementation will be taken into consideration.
4 Description of ideal candidate[8]	The ideal candidate should prove PhD. or equivalent skill. Should published at least two papers accepted for the publication in the journal with relevant Impact Factor. The candidate should have knowledge in structural steel engineering and their design by advanced method preferable in seismic area.

Mentor

František Wald	Civil engineering	Steel and timber structures	frantisek.wald@fsv.cvut.cz

Salary: CZK 61 820 per month

CTU Global Postdoc Fellowship

Research topic #1-4

1 Topic	The strengthening of bridges with the SMA materials
2 Link to topic / project page	http://people.fsv.cvut.cz/www/ryjacpav/postdoc
3 Short description of topic	The existing bridge infrastructure is getting older and do not satisfy the needs of the modern transport. That is why strengthening of bridges, such as steel bridges or prestressed concrete structures, is becoming very important issue. The topic deals with the use of new, perspective materials, such as SMA (shape memory alloy), that have unusual parameters and advantages. On the other side, there is limited knowledge about the activation of the material, its anchoring to the structure, using of connections and welds.
4 Description of ideal candidate	The ideal candidate should prove PhD or equivalent skill, should have at least two papers accepted for the publication in the journal with relevant Impact Factor. The candidate should have knowledge in bridge engineering and their strengthening.

Mentor

Pavel Ryjáček	Faculty of Civil Engineering	Department of steel and timber structures	Pavel.ryjacek @fsv.cvut.cz

Salary: CZK 62 190 per month

Research topic #1-5

1 Topic	Hardware and Software Means to Aid Diabetic ulcer treatment
2 Link to topic / project page[6]	https://tinyurl.com/8hakak43
3 Short description of topic[7]	Within this project, the candidate will develop experimental tools, both hardware and software (a control system) to aid therapists (medical doctors) or their patients to monitor diabetic ulcer (diabetic leg) development in order to better treat and heal the trauma. The unique set of foreseen means consist of (i) a dummy of a wound with a fully controllable spatial distribution of moist [1] and temperature field [2] to foster developments in related areas by avoid testing the research results on humans (legislation purposes), (ii) a development of contact-less devices of thermal field (portable thermo-cameras [2]) and non-invasive moist observation [1], (iii) development of a protocol of connecting the previously proposed "sensorics" with smart phone-like devices in order to provide instant data to doctors and patients/users.
	The project will be conducted in collaboration with Jan Havelka, the Research Assistant at Experimental Center within the OpenMechanics Lab that is a joint project of Experimental Centre and Department of Mechanics of FCE CTU in Prague.
4 Description of ideal candidate[8]	An ideal candidate for this position should optimally have a proven experience (or express enthusiasm) in • Code development skills, preferably in MATLAB, C++, or an equivalent programming language. • AI strategies • Arduino/Raspberry hardware and control software development • Contactless thermo-mechanical field measurement (experimentation observation) techniques as e.g. DIC [5, 6] • Additive manufacturing/3D printing skills

Mentor

Jan Novák	Faculty of Civil Engineering	Experimental Centre	novakja@fsv.cvut.cz

Salary: CZK 64 000 per month

Research topic #1-6

1 Topic	**Basic creep in blended cement systems using nanoindentation and multi-scale modeling**
2 Link to topic / project page[6]	We provide a list of recent publications focusing on the topic: • V. Šmilauer, P. Havlásek, L. Dohnalová, R. Wan-Wendner, Z. P. Bažant: Revamp of Creep and Shrinkage NU Database, Biot-Bažant Conference, June 1-3, 2021. • P. Havlásek, V. Šmilauer, L. Dohnalová, R Sovják: Shrinkage-induced deformations and creep of structural concrete: 1-year measurements and numerical prediction, Cement and Concrete Research, 2021. • M. Hlobil, V. Šmilauer, G. Chanvillard: Micromechanical multiscale fracture model for compressive strength of blended cement pastes. Cement and Concrete Research, 2016. • V. Šmilauer, Z. P. Bažant: Identification of viscoelastic C-S-H behavior in mature cement paste by FFT-based homogenization method. Cement and Concrete Research, 2010. • J. Němeček, J, V. Šmilauer, L. Kopecký, L. Nanoindentation characteristics of alkali-activated aluminosilicate materials Cement and Concrete Composites, 2011.
3 Short description of topic[7]	The creep of ordinary Portland cement-based concretes (OPC) has been known for decades on laboratory samples and long-span bridges. The C-S-H phase has been identified as the primary microstructural component responsible for the time-dependent behavior in OPC. Nowadays, blended cement systems containing typically 20-30% of slag, fly ash, calcined clays etc. are extensively used over practically all civil engineering applications. Databases and design codes are based dominantly on OPC systems where blended systems are scarcely represented. The link between chemistry of blended cement systems, their microstructure and small-scale phase creep properties would allow more accurate predictions, which is the main research topic. In this project, the basic creep mechanisms and material characterization is planned to be established by short-term microscale measurements provided by nanoindentation. A database of basic creep functions will be created leading to a calibration of microstructure-based multi-scale model. A 3D microstructure of the blended system will be generated based

	on the thermodynamic and/or hydration models. The results from experiments and microstructure models will be linked in predictions based on numerical homogenization to predict creep properties of cement paste, mortar and concrete.
4 Description of ideal candidate[8]	The ideal candidate should hold a PhD in civil engineering or materials science with strong background in chemistry and mechanics of cementitious systems. He/she should have a good ability to independently perform advanced experiments (microstructure oriented), have experience with nanoindentation and microscopy, at least basic knowledge of microstructure modeling, thermodynamics, micromechanics and numerical homogenization. The candidate must prove a good publication history, history of conference attendance and team working.

Mentor

doc. Ing. Jiří Němeček, Ph.D., DSc.	Civil Engineering Faculty	Mechanics	Jiri.nemecek@fsv.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #1-7

1 Topic	**Steel structure global analysis methods representing nonlinear stress-strain material response**
2 Link to topic / project page[6]	https://ocel-drevo.fsv.cvut.cz/jandera/research/
3 Short description of topic[7]	The project focuses on new metal (mainly steel) materials in structures which exhibits significantly non-linear stress-strain behaviour. This includes high-alloy steels such as stainless steel, where the degree of material non-linearity is highest among all common steels. Stainless steels are considered as the main and reference material in the project but the project will also cover other materials such as more common high strength steels, significantly cold-formed carbon steels or aluminium alloys. In the second stage, it may be used also for advanced design of steel structures at elevated temperature (fire). The main goal is the development of elastic global analysis methods (of various sophistication level) for steel structures representing nonlinear stress-strain material response based on numerical simulations. The numerical models and the reliability study will be validated on tests on stainless steel beam-columns and portal frames carried out by the mentor's research group recently (2018 - 2021).

4 Description of ideal candidate[8]	The candidate should ideally prove: - PhD in structures, preferably focused on steel structure stability - proficiency in numerical modelling of structures (preferably in software Abaqus) - proficient level of English - at least two relevant journal papers accepted for publication (IF – indexed journals)

Mentor

Michal Jandera	**Faculty of Civil Engineering**	**Department of Steel and Timber Structures**	**michal.jandera @fsv.cvut.cz**

Salary: CZK 61 820 per month

CTU Global Postdoc Fellowship

Topics/positions available at the

Faculty of Mechanical Engineering.

Applications should be sent to:

vyzkum@fs.cvut.cz

or

Fakulta strojni CVUT

Oddeleni zamestnanecke

Technická 4

166 07 Praha 6

Czech Republic

CTU Global Postdoc Fellowship

Research topic #2-1

1 Topic	**Future Green Vehicles: New Powertrains and Passive/Active Safety**
2 Link to topic / project page	
3 Short description of topic	Automotive segment undergoes a significant change due to strong focus on hybridization/electrification related to global targets of CO2 reduction (among others). This leads to R&D in the field of new powertrain solutions and improved passive/active safety of future green vehicles. The FME of CTU in Prague spends a lot of effort/resources on these topics. The following research subtopics have been elaborated recently (within different national and EU grants/projects) while the potential post-doc candidates are expected to take part in some of them: • Unconventional materials and processes in design and manufacturing of vehicle transmissions. • Passive (and active) safety of vehicles mainly focused on testing methods/procedures using available experimental equipment. • Application of alternative fuels in internal combustion engines while also focusing on unconventional combustion modes (e.g., very lean mixture concept + pre-chamber ignition system). • Investigation of possibilities for improvement of PEM fuel-cell efficiency.
4 Description of ideal candidate	• Ph.D. or equivalent degree • At least two papers accepted for publication in a journal with minimal Impact Factor 1.0 • Experience with either advanced simulation tools or measurements

Mentor

doc. Dr. Ing. Gabriela Achtenová	Faculty of Mechanical Engineering	U 12120 + U 12201	Gabriela.Achtenova@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-2

1 Topic	Research of small modular nuclear reactors
2 Link to topic / project page	Vaclav.dostal@fs.cvut.cz
3 Short description of topic	At present, the complexity of building traditional large nuclear power units is becoming more and more difficult, which is why worldwide research is increasingly focusing on small modular nuclear reactors for the production of electricity and heat. The Department of energy engineering deals with this topic in projects and qualification theses. The involvement of a postdoctoral worker is therefore possible immediately in a number of areas. This is mainly the basic design of the entire reactor unit. In addition to design tasks, it is necessary to process a number of thermal hydraulic, reactor physic and safety analyzes. Last but not least, the work will focus on the application of integral security methods and probabilistic risk analysis. It is also important to work on implementation studies for real applications and the development of a proven business model for the deployment of small modular nuclear reactors, which determines the design of such an energy system. The main research area at the Department of energy engineering is the molten salt cooled micro reactor Energy Well. This concept is being developed at the Research Center Řež and CTU collaborates on its development. One of the main issues with these reactors is their deployment. The possible application areas such as remote mining projects, remote settlements, desalinization units or island countries such as Indonesia are currently being researched for their potential. In addition application potential for district heating and hydrogen production are under investigation as well.
4 Description of ideal candidate	Experience with small modular reactors. Knowledge of economics of nuclear power. Mechanical engineering experience.

Mentor

Václav Dostál	Faculty of Mechanical Engineering	Department of Energy Engineering	Vaclav.dostal@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-3

1 Topic	Mathematical modeling of two-phase flows
2 Link to topic / project page	https://www.researchgate.net/project/Numerical-simulations-of-two-phase-flows
3 Short description of topic	The project deals with the development of mathematical models and numerical methods for two-phase flows including problems with free-surface or with the phase change (e.g. flows of condensing steam).
4 Description of ideal candidate	The candidate should have • deep knowledge of mathematical modeling with focus on numerical simulation of Navier-Stokes equations • high C++ skills with at least basic experiences with programming within OpenFOAM framework Basic knowledge of other CFD software packages (ANSYS, …) are welcome.

Mentor

1 Name, surname	2 Faculty-Institute	3 Department	4 E-mail
Jiří Fürst	Faculty of Mechanical Engineering, Czech Technical university in Prague	Dept. of Technical Mathematics	Jiri.Furst@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-4

1 Topic	Research and development of smart building solutions for a decarbonized integrated energy system
2 Link to topic / project page	http://utp.fs.cvut.cz/vyzkum/
3 Short description of topic	Energy system integration – the coordinated planning and operation of the energy system 'as a whole', across multiple energy carriers, infrastructures, and consumption sectors – is considered as the pathway towards an effective, affordable and deep decarbonisation of the European economy (EC document COM/2020/299 "Powering a climate-neutral economy: An EU Strategy for Energy System Integration"). Buildings are important in this context as they offer ample room to increase energy efficiency and instead of being passive consumers they should take an active role in energy supply and storage. The Environmental Engineering Department of the CTU in Prague has a long track record in research and development of building energy systems. The focus was on indoor environment in terms of occupant thermal comfort, indoor air quality and the energy performance of heating, ventilation and air-conditioning systems. However, as the role of buildings will be extended in the integrated energy concept, the focus moves to smart solutions for optimal integration of buildings in modern district energy (both thermal and electrical) systems. The general research topic will be smart building energy systems in relation to indoor environmental quality as well as to energy performance supporting the upcoming system integration strategies. The new postdoc will support our goal to establish a group providing research and expertise in arising topics associated with the activities of the International Energy Agency's Energy in Buildings and Communities (IEA EBC) program, such as: • fuel-shift impact on building energy systems (power-to-heat strategies), • building energy systems as part of energy communities (communities and prosumers support), • building-to-grid interaction (related to both thermal and electrical energy) • building flexibility aggregation • indoor environment in the context of energy system integration strategies • environmental impact of energy system integration strategies
4 Description of ideal candidate	Computational modeling and simulation is our main research methodology for analyzing and optimizing the energy system integration potential of the built environment within the overall heat and electricity infrastructure. We plan to expand existing building energy simulation software (e.g. TRNSYS, Modelica / Dymola, etc.) with possible extensions via generic simulation tools (e.g. Matlab, Python). Our expectations from the person at postdoc position would be: • to be fully involved in the described research within the existing team • to be actively involved in research proposal development and acquisition activities • to lead the publication activities of research outcomes in relevant impacted journals • to collaborate with one of the IEA EBC Annex projects and in this context, to represent our department and CTU in Prague in international research communities

Mentor

Jan Hensen	Faculty of Mechanical Engineering	Dept. of Environmental Engineering	Joannes.Hensen@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-5

1 Topic	Integrated CCU technology with electricity storage
2 Link to topic / project page	http://energetika.cvut.cz/en/bio-ccs-projekt/
3 Short description of topic	The research topic focuses on integration of a Power-to-hydrogen storage system with a CCU technology that captures CO2 from either fossil or renewable/alternative fuels and converts to methane or methanol. Electricity input is from a renewable energy source (PV, wind). The work shall include numerical modelling as well as experimental and development work to investigate the integration of the technology chain in the laboratory pilot scale and to validate the numerical models.
4 Description of ideal candidate	We expect an applicant with relevant education and skills in energy, process or chemical/mechanical engineering. The applicant should have deeper knowledge in the field of CCS/CCU technologies, especially, but restricted to only, oxyfuel combustion and low-temp adsorption within the CO2 capture and direct synthesis (methane, methanol, etc.) within the CO2 utilization. Appreciated is knowledge in renewable electricity sources, particularly solar and wind. He/she has to be able to use process modelling software (e.g. Aspen+) and to have experiences and abilities with design, build and run of laboratory experiments.

Mentor

Jan Hrdlička	Faculty of Mechanical Engineering	Department of Energy Engineering	jan.hrdlicka@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-6

1 Topic	Mixing of multiphase systems
2 Link to topic / project page	http://pt.fs.cvut.cz/en/research-and-development/
3 Short description of topic	Mixing is a key operation affecting not only the production but also the quality of the product achieved in most production lines of the chemical and food industry. For this reason, it is necessary to pay attention to develop the study of processes taking place in the agitated batch of reactors and bio-reactors with standard and especially non-standard geometrical configuration. The research will focus on the mechanical mixing of multiphase systems, hydraulic mixing, and mixing in apparatuses equipped with static mixers. Special attention will be paid to the agitation of high viscosity batches that exhibit non-Newtonian behavior (viscoplastic and viscoelastic). The research will be based on a theoretical analysis of the transport phenomena (momentum, heat and mass) in agitated batch, supplemented by a wide range of experiments and CFD simulations of these processes. Theoretical and experimental results will be interpreted not only to expand theoretical knowledge about this process, but it will be possible to apply them in industrial production and processing technologies and use them to design unique configurations of industrial equipment to achieve the required technological goals. Within the study of processes in agitated batch, it is possible to focus our interest on the following particular research aims: • Study of hydrodynamics in an agitated batch in equipment with non-standard geometrical configuration. • Mixing of high viscosity and non-Newtonian (viscoplastic, viscoelastic, …) batch in mechanical mixing equipment and in systems with static mixers. • Mixing of heterogeneous and high-concentrated suspensions. • Dispersion of two-phase systems (liquid - liquid, liquid - solid, liquid - gas). • Heat transfer in an agitated batch and between the individual phases. • Mass transfer in an agitated batch. • Study of the kinetics of processes taking place in an agitated batch. • Design of unique configurations of agitated reactors, bioreactors and other mixing equipment, development of new unique types and geometries of mechanical agitators and static mixers. • Scale-up of mixing processes and equipment.
4 Description of ideal candidate	The candidate should be interested in a CFD analysis of processes, the realization of model and pilot scale experiments, evaluation and interpretation of obtained data.

Mentor

Tomáš Jirout	Faculty of Mechanical Engineering	Department of Process Engineering	Tomas.Jirout@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-7

1 Topic	Joining and surfacing of 3D structural parts
2 Link to topic / project page	
3 Short description of topic	Research into the use of WAAM (Wire and Arc Additive Manufacturing) technology in connection with the identification of suitable welding strategies and temperature cycle settings for specific applications. Determining the influence of the used strategy and process parameters (heat input) on the structural and mechanical properties of modern materials (such as high-strength steels and non-ferrous metal alloys). In addition to the use of modern modifications of the MIG / MAG welding method, the involvement of special methods, such as plasma resp. microplasma surfacing, etc. Furthermore, research in the field of joining advanced materials by resistance welding methods, electrode wear, difficult to weld combinations of materials, description of connection mechanisms and material changes at the connection point.
4 Description of ideal candidate	- Active knowledge of using robotic systems (Fanuc, ABB) and arc welding sources (Fronius, Migatronic, EWM, etc.) - Experience with high speed (FASTCAM) and IR camera (FLIR), measurement of temperature cycles (Ahlborn) and temperature fields, etc. - Basic experience with NDT and destructive testing of materials and welded joints - Experience with publishing activities (min. 5 publications with IF 0.7 and higher in the last 5 years)

Mentor

Ladislav Kolařík	Faculty of Mechanical Engineering	Department of Manufacturing Technology	ladislav.kolarik@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-8

1 Topic	Space environment and systems
2 Link to topic / project page	T.B.D.
3 Short description of topic	The topic shall deepen the topics already started at the CTU FME DAE. The topic can cover e.g. properties of non-traditional construction materials under high vacuum thermal stress conditions, effects of reduced-/hyper-gravity on light structures, mechanisms and organisms, low and high-speed flight at stratospheric/Mars conditions, characterization of gas/plasma flows in rocket engines and physical microthrusters, non-classical satellite power systems or the optimalization of future satellite constellations for the mitigation of space debris.
4 Description of ideal candidate	I addition to the general requirements, the candidates should be familiar with the field connected to some part of the topic.

Mentor

Jaroslav Kousal	Faculty of Mechanical Engineering (FME)	Department of Aerospace Engineering (DAE)	jaroslav.kousal@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-9

1 Topic	Processes, equipment and technologies for biorefinery
2 Link to topic / project page	http://pt.fs.cvut.cz/en/research-and-development/
3 Short description of topic	The biorefinery concept represents a promising direction of material-energy, economically profitable and environmentally friendly technology to convert waste into advanced biofuels and noble chemicals. The technology itself consists of several technological units, i.e. (1) pretreatment of raw material, (2) primary processing (production of primary products), (3) secondary processing (use of residues after production of primary products) and (3) separation, purification and refining of products. The mentor offers the following R&D topics in this area: • Grinding and milling of lignocellulosic biomass or minerals for the production of mineral carbonates - modelling specific energy requirement for its size reduction, the influence of process parameters on the quality of milled material. Rules of scaling and technology design, technical and economic feasibility studies, risk analysis. • CO2 capture and purification from emission gases - experimental analyzes of CO2 separation from industrial flue gases by absorption, adsorption, membrane processes and their mutual combinations. Rules for scaling up and designing hybrid technologies, technical and economic feasibility studies, risk analysis. • Pretreatment of biomass with lignocellulosic base - alkaline hydrolysis, acid hydrolysis, hydrothermal treatment. Experimental analysis of the influence of process conditions on the quality of the raw material, the influence on the increased yield of biogas/bioethanol. Rules of scaling and technology design, technical and economic feasibility studies, risk analysis. • Photobioreactors - experimental and CFD analyzes transfer phenomena in microalgal photobioreactors (plate, tube, Couette-Taylor), modelling of CO2 conversion and O2 degassing in the context of RTD, system hydrodynamics and mass transfer, intensification of transfer phenomena, thin-film photobioreactors. Rules of scaling and technology design, technical and economic feasibility studies, risk analysis. • Separation of microalgae from the aqueous environment - study and modelling of the influence of experimental conditions on the efficiency of separation of microalgae from the aqueous environment using methods such as flocculation, flotation, filtration, centrifugation and their combinations. Rules of scaling and technology design, technical and economic feasibility studies, risk analysis. • Microalgal disintegration - experimental analysis and modelling of processes needed to disconnect the cell wall of microalgae, e.g. using a ball mill, bead mill, high-speed stator-rotor system, ultrasound, expansion nozzles and their combinations. Rules of scaling and technology design, technical and economic feasibility studies, risk analysis. • Microalgae drying - experimental analysis of spray dryer potential for drying microalgae suspension, design, experimental analysis and modelling of spray dryer nozzles depending on the rheological behaviour of microalgae aqueous suspension. Rules of scaling and technology design, technical and economic feasibility studies, risk analysis.

4 Description of ideal candidate	The candidate should be interested in waste conversion technologies to have professional skills and publication history on the given topic.

Mentor

Lukas, Kratky	Faculty of Mechanical Engineering	Department of Process Engineering	Lukas.Kratky@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-10

1 Topic	INVESTIGATION AND HARNESSING OF SUPER-HEAT TRANSFER DURING ULTRA-FAST PROCESSES
2 Link to topic / project page	
3 Short description of topic	Sparing energy, more efficient transport and conservation of energy, as well as more efficient cooling of systems generating heat during their operation become one of the most important tasks to be tackled by modern science and technology. The paradox of instantaneous propagation of energy is intrinsic to the classical models of energy transport. This paradox becomes well-pronounced during ultra-short processes. To remove the paradox, phase-lagged models of energy transport have been proposed. The analysis of the solutions to the phase-lagged energy equations suggests that when the characteristic time of the process is much less than the lag time, the wave mode of transport becomes the main mechanism of energy transfer. Activities: • Theoretical studies of ultra-short heat transfer processes, • design a prototype system, • experimental studies – a pump-probe transient reflection.
4 Description of ideal candidate	• PhD or equivalent degree, • at least two papers accepted for publication in a journal with relevant Impact Factor, • the mentor can require additional skills relevant to research field/topic.

Mentor

Vladimir Kulish	Faculty of Mechanical Engineering	Department of Fluid Dynamics and Thermodynamics	vladimir.kulish@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-11

1 Topic	High or low cycle fatigue under variable loading
2 Link to topic / project page	[zatím přiložené pptx]
3 Short description of topic	Topic a) Search for an optimum prediction approach in cases, where the fatigue response of components to **variable amplitude loading** is affected by mean stress, inhomogeneous stress distribution, multiaxial loading Topic b) Deep learning based models for isothermal low-cycle fatigue and fatigue-creep applied as constitutive user function in finite element software.
4 Description of ideal candidate	For topic a) Ph.D. study focused on fatigue analysis, knowledge about computational fatigue procedures; experience with implementation of such concepts. For topic b) Ph.D. study focused either on deep learning, either on constitutive material modeling. Ability and enthusiasm to extend it to the suggested multidisciplinary topic.

Mentor

Milan Ruzicka	Faculty of Mechanical Engineering, Czech Technical University in Prague	Dept. of Mechanics, Biomechanics and Mechatronics	milan.ruzicka@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-12

1 Topic	Digital Twins for modeling the machine tool and process interaction
2 Link to topic / project page	http://www.rcmt.cvut.cz/wp-content/uploads/2020/04/06_Virtual-Machining.pdf http://www.rcmt.cvut.cz/wp-content/uploads/2020/04/05_Smart-Machine-Tool.pdf
3 Short description of topic	Digital Twins of machine tool and machining process represent up-to-date advanced tools for more efficient process planning and improved machine tool performance. Unique concept of machine tool and proces Digital Twins for technology applications has been developed at CTU since almost 15 years. Currently it has reached a level of software solution, which allows virtual machining simulations for prediciting machining process results (time, quality and accuracy of machined surfaces) and optimization of process strategies and process parameters. Workpiece digital twin is a result of the complex simulation of the machine tool – process interaction and dynamic behavior of the machine tool and the workpiece. Our research goal is enhancing and mastering this concept for every-day practical implementation in the industrial production. Research topics: • Dynamic interaction of compliant machine tool and workpiece, modeling of machining stability, predictions of machining performance and strategies for the optimization of machining process parameters and machine tool control parameters • Integration of process data from the machine tool and from the simulation, development of strategies for automated analysis of machining process status and adaptive corrections of machining process parameters • Inprocess monitoring of machine tool and process status, identification of chatter in machining • Dynamics of machining thin-walled workpieces • Virtual modeling of machine tool dynamic and thermo-mechanical behaviour during machining proces. Use of MOR techniques. • Coupled digital models with retunable dynamic properties • Machine tool Digital Twin updating by using machine learning strategies

4 Description of ideal candidate	• Structured CV • Cover letter • Written proposal of planned research and pedagogical activities at U12135 • Selected 3 best articles published in impact journals for the last 5 years • 3 references to your previous research and pedagogical activities • PhD degree in mechanical / electrical engineering, manufacturing engineering, machine tools, artificial intelligence, control engineering or related fields • At least one year of postdoctoral / researcher / assistant professor experience and internship outside the Czech Republic • Excellent results of scientific research, as evidenced by contributions to international and peer-reviewed conferences and impact journals • High motivation for the realization of one's own vision in the research environment of FME CTU in Prague • Team player with the ability to communicate clearly and eagerly seek and use synergies of topics and project links at FS CTU • Experience in obtaining external funding and focusing on industry is an advantage.

Mentor

Matěj Sulitka	Faculty of Mechanical Engineering	Department of Production Machines and Equipment	M.Sulitka@rcmt.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-13

1 Topic	Numerical solution of PDEs with high order methods
2 Link to topic / project page	https://www.researchgate.net/project/Numerical-solution-of-PDEs-with-high-order-methods
3 Short description of topic	The project deals with the development of high order methods (e.g. discontinuous Galerkin) for numerical solution of PDEs in the continuum mechanics.
4 Description of ideal candidate	The candidate should have • deep knowledge mathematical modeling in continuum mechanics • deep knowledge of numerical methods for PDEs (finite elements, DG, ...) • high C/C++ skills

Mentor

Petr Sváček	Faculty of Mechanical Engineering, Czech Technical university in Prague	Dept. of Technical Mathematics	Petr.Svacek@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-14

1 Topic	Control of vibration and motion of flexible mechanical systems
2 Link to topic / project page	
3 Short description of topic	Control of vibration and motion of flexible mechanical systems is a difficult task due to many/infinite number of DOFs. Two promising approaches are proposed: multiple frequency absorber by time-delay feedback control (improvement of delayed resonator) and/or wave-based control. Both delayed resonator and wave-based control are well established control concepts. The proposed research is to investigate new advanced modifications of these concepts. The open problem for delayed resonator is to reach solution with direct design procedure ideally tunable in real time as well as experimental demonstration of its tuning. There are proposed several approaches how to reach that: discretized delayed system or replacement of delay by time derivatives. The wave-based control has demonstrated impressive result in stable and motion of many flexible mechanical systems. The open problem is how to apply this control to any flexible mechanical system. The condition of stability has been derived. And this condition can be used for enlargement of flexible systems that can be stably controlled by wave-based control. The proposed approach is to use frequency shaped feedback instead of simple one. Both topics promise interesting research and publication opportunities.
4 Description of ideal candidate	The candidate should have knowledge and be interested in vibration of mechanical systems and their control.

Mentor

Michael Valášek	Faculty of Mechanical Engineering	Department of Mechanics, Biomechanics and Mechatronics	Michael.Valasek@ fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-15

1 Topic	Computational model of multi-material continuum on the macroscopic and the microscopic level
2 Link to topic / project page	WOS
3 Short description of topic	Assembling of computational procedures for solving continuum mechanics at the macroscopic and microscopic level. It would be a proposal of procedures for the prediction of stress and deformation fields of heterogeneous materials (most often matrices and filling material) to achieve the required physical and material-mechanical properties. Last but not least, the problem of the life cycle of the material created in this way should be solved. The derived procedures will be thoroughly verified with experimental data. The aim will be to take into account all available knowledge at the current level of knowledge (modeling of adhesion, material damping, degradation of physical parameters, the influence of temperature fields, ...). Furthermore, the possibility of using the method of 3D printing from multiple materials will be considered in order to achieve the required local stiffness characteristics according to the requirements of industrial practice.
4 Description of ideal candidate	Advanced knowledge in the computational mechanics (discrete systems, continuum systems). Advanced knowledge in the programming techniques (C language, Matlab). The ability to assemble and do the technical experiment. At least the basic skills in using the commercial software (Ansys, Cornsol,)

Mentor

Tomáš Vampola	Faculty of Mechanical Engineering	Mechanics, Biomechanics and Mechatronics	Tomas.Vampola@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-16

1 Topic	Surface, interface and coating modification by directed energy deposition (ion or electron beams)
2 Link to topic / project page	
3 Short description of topic	The research topic focuses on theoretical and experimental solutions in the following areas: • Depth distribution of admixture and lattice defects (experiments and Monte Carlo simulation codes). • Modification and growth of crystal structure (experiments and MD and DFT simulations). • Study of ion implantation, ion beam assisted deposition, ion beam mixing. You will be working on the theoretical and experimental development of ion beam modified layers for advanced applications in fuel cells, supercapacitors and biomedical surfaces. Your research will provide insight into the radiation-induced formation of nitrogen-oversaturated structures of transition metals. This opportunity will allow you to publish high-quality research articles and contribute to the materials design for advanced applications.
4 Description of ideal candidate	• PhD in physics, materials science, materials engineering or quantum chemistry. • Research experience in the field. • Knowledge of MD and DFT simulation is an added value.

Mentor

Petr Vlcak	Faculty of Mechanical Engineering	Department of Physics	Petr.Vlcak@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-17

1 Topic	**Theory and applications of time delay systems**
2 Link to topic / project page	https://control.fs.cvut.cz/en/research-projects/
3 Short description of topic	• Tools for spectral theory of time delay systems: spectrum computation methods; spectral optimization design; numerical methods for solving functional differential equations; frequency domain methods. • Time delay algorithms in vibration suppression: optimal input shaping; multidimensional vibration suppression by delayed resonator techniques; non-collocated vibration suppression; advanced repetitive control. • Model predictive control of systems with time varying delays.
4 Description of ideal candidate	• Background in theory of time delay systems • Experience with computational/optimization methods • Background in vibration suppression methods or process control

Mentor

Tomáš Vyhlídal	FME CTU	Instrumentation and Control Eng.	tomas.vyhlidal @fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #2-18

1 Topic	**Modern trends and disruptive technologies changing the management of industrial enterprises**
2 Link to topic / project page	https://www.fs.cvut.cz/en-ustavy/en-sekce-ustav-rizeni-a-ekonomiky-podniku/en-ustav-rizeni-a-ekonomiky-podniku-12138/en-odborna-cinnost-12138/
3 Short description of topic	Modern trends and new disruptive technologies dramatically changing the environment of industrial businesses. The process of implementation of modern technologies and evaluation of their sustainability brings great challenges for research, as well as the implementation of new business models associated with them and the use of modern tools for their management. The candidate's future research may focus on the following areas: • Quantitative sustainability (economic and environmental) assessment of modern technologies and products. • Modeling the impact of sustainability strategies on the financial performance of industrial companies. • Measuring and reporting sustainable business performance in the economic, environmental, and social areas. • Influence of disruptive technologies (e.g. electromobility, additive manufacturing, circular economy) and green initiatives (e.g. Green Deal) on the Czech/European industry – development of the evaluation methodology, identification of risks and potentials, quantification of potential economic and environmental impacts, definition of transformation paths. • Evaluation of the level of maturity of digital transformation in industrial companies (especially in SMEs), identification of risks and potentials, determination of transformation paths. • Implementation of modern tools supporting managerial decision-making process in industrial companies – e.g. Business Intelligence, Machine Learning, Manufacturing Systems Modelling etc. • Lean Manufacturing and other modern methods for management of manufacturing systems in Industry 4.0 environment. • Industrial world after COVID 19 pandemics – new trends and its socio-economic impacts – e.g. massive development of home office and remote work. • Transforming the education of industrial managers for the era of digitization and Industry 4.0.
4 Description of ideal candidate	Above all, the candidate should be independent, proactive, and creative. Candidate should be able to independently search for new research opportunities, collaboration with other research organizations and have his own experience with the publishing process (ideally in the role of a corresponding author). The big advantage is the knowledge of the application of modern IT tools - especially for data processing and visualization, business

	management, cost and environmental impacts modelling, machine learning – e.g. application of advanced MS Excel features (Pivot tables and charts, Power Query), Business Intelligence tools, Phyton, Life Cycle Assessment SW tools (preferably SimaPro).

Mentor

Miroslav Žilka	Faculty of Mechanical Engineering	Department of Enterprise Management and Economics	Miroslav.zilka@fs.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Topics/positions available at the

Faculty of Electrical Engineering.

Applications should be sent to:

drimakat@fel.cvut.cz

or

FEL ČVUT

Zaměstnanecké oddělení

Attn: Ing. Kateřina Dřímalová

Technická 2

166 27 Praha 6

Czech Republic

CTU Global Postdoc Fellowship

Research topic #3-1

1 Topic	Ab initio investigation of the effect of heavy-ion irradiation on the mechanical properties of nanostructured alloys
2 Link to topic / project page	https://nano.cvut.cz/jobs-opportunities/ab-initio-investigation-of-the-effect-of-heavy-ion-irradiation-on-the-mechanical-properties-of-nanostructured-alloys
3 Short description of topic	Ions implantation leads primarily to the formation of vacancy-type of defects and self-interstitial atoms (SIAs). With increasing ions fluence, temperature, and time, these point defects migrate and eventually cluster, forming dislocation loops, voids, and stacking faults in metals. When the density of these defects is high, coalescence will occur and some detrimental effects will appear such as swelling, hardening, embrittlement, blisters, and exfoliation, and direct failure. It is well established in a single crystal that strains and stresses can strongly influence the defect growth and impurity migration, and can consequently play a major role in the microstructural transformations of materials under irradiation. A full understanding of these phenomena and reliable prediction of a material lifetime is required in multilayer systems. The successful candidate is expected to perform ab initio simulations to reveal the effect of radiation damage on the mechanical properties of metallic multilayers such as created strain, elastic properties, Vicker's hardness, and fracture toughness.

Mentor

Huseyin Sener Sen	Faculty of Electrical Engineering	Department of Control Engineering	senhusey@fel.cvut.cz

Salary: CZK 62 200 per month

CTU Global Postdoc Fellowship

Research topic #3-2

1 Topic	Nanostructure coating design by advanced magnetron sputtering
2 Link to topic / project page	https://nano.cvut.cz/jobs-opportunities/nanostructure-coating-design-by-advanced-magnetron-sputtering
3 Short description of topic	The project's core objective is the reduction of friction by the simulated-aided design of nanostructured sputtered coatings. We will explore various nanostructures to achieve novel low-friction surfaces by controlled diffusion or adaptive structure. The project is carried out in close collaboration with a world-leading industrial partner and combines different theoretical approaches to allow a rational design of surfaces and lubricants for automotive applications. The work will be carried out in our new thin-film laboratory using a large, industrial-scale Oerlikon Balzers deposition machine (HIPIMS) and a variety of analytical tools (Raman spectroscopy, electron microscopy, tribometers).
4 Description of ideal candidate	Successful candidates must have a PhD in Physics, Chemistry, Materials Science, or closely related disciplines. Experience with magnetron sputtering and thin film characterization (structure, mechanical properties) is mandatory. Previous experience in the HiPIMS process, theoretical or experimental, is welcome. Good knowledge of English, both written and oral, is compulsory.

Mentor

Tomas Polcar	FEL	Control Engineering	polcar@fel.cvut.cz

Salary: CZK 62 200 per month

CTU Global Postdoc Fellowship

Research topic #3-3

1 Topic	Adaptive Force Matching for Materials Science
2 Link to topic / project page	https://nano.cvut.cz/jobs-opportunities/adaptive-force-matching-for-materials-science
3 Short description of topic	The Adaptive Force Matching scheme will be implemented and used in order to refine and/or parameterize ex-novo interaction potentials for materials relevant to tribological applications. The method consists of alternating classical and ab initio simulations in order to explore relevant regions of the phase space, and produce a training set of configurations and forces, respectively. Particular focus will be put to reactive force fields, i.e. able to describe breaking/formation of chemical bonds. The generated force fields will then be extensively tested in order to assess their performance in terms of ability to predict structural, elastic and dynamical target properties.
4 Description of ideal candidate	Successful candidates must have a PhD in Physics, Chemistry, Materials Science or closely related disciplines. Experience with classical molecular dynamics simulations or electronic structure calculations is mandatory. Previous experience on the development of classical force fields and/or with the QM/MM method represents a plus. Researchers are expected to perform calculations on Linux-based HPC centers. Good knowledge of English, both written and oral, is compulsory

Mentor

Paolo, Nicolini	Faculty of Electrical Engineering	Department of Control Engineering	nicolpao@fel.cvut.cz

Salary: CZK 62 200 per month

CTU Global Postdoc Fellowship

Research topic #3-4

1 Topic	Triboelectric nanogenerators design for green energy production
2 Link to topic / project page	https://nano.cvut.cz/jobs-opportunities/triboelectric-nanogenerators-design-for-green-energy-production
3 Short description of topic	The recent and fast growth of electronic miniaturization called for the development of power nanogenerators which can harvest energy from the environment. Among them, triboelectric nanogenerators (TENGs) are the forefront of current research: they are capable to convert friction into electric power. Recent findings suggest that layered transition metal dichalcogenides (TMDs) may be the best candidate materials for TENGs with high efficiency. We plan to study the atomic level phenomena directing the charge current formation in layered TMD-based TENGs under tribological conditions. Our final goal is to provide experimental guidelines on how to design efficient TENG devices by formulating predictive paradigms on the tribocharge generation and diffusion. Such guidelines will be possibly validated by assembling and testing a TMD-based TENG prototype.
4 Description of ideal candidate	A strong background in solid-state density functional theory is mandatory. Experience in using large-scaling DFT methods represents a great advantage. Researchers are expected to perform calculations on Linux-based HPC architectures, as well as writing and submitting proposals to obtain access to HPC resources.

Antonio Cammarata	Faculty of Electrical Engineering	Department of Control Engineering	cammaant@fel.cvut.cz

Salary: CZK 62 200 per month

CTU Global Postdoc Fellowship

Research topic #3-5

1 Topic	Optimality in Electromagnetism and Its Feasibility
2 Link to topic / project page	Postdoctoral researcher will cooperate with CEM Group https://elmag.fel.cvut.cz/oblasti-vyzkumu/cem/ and the team of GACR Junior Start 21-19025M project (the project's web page is under development).
3 Short description of topic	The main task intended for the postdoctoral research is to closely collaborate with the principal investigators of the group on closing the gap between fundamental bounds recently established in electromagnetism and performance of the designs found with topology optimization. In order to close this gap, the fundamental bounds have to be further tightened by, e.g., local energy conservation constraints or multi-frequency behavior and, simultaneously, topology optimization routines must be improved to better utilize complete information about all possible shape perturbations. It is expected that within the postdoctoral stay, the established concepts of optimality and the way how to approach it with electromagnetic design will be extended from time-harmonic to general time variations. Tools such as quadratic and combinatorial optimization, modal decompositions and tools of computational electromagnetism will be used and further developed. An emphasis will be given to the development of in-house tools without necessity to rely on commercial software. The application domain spans from static fields to antenna arrays, MIMO antennas, and electrically small antennas, and to plasmonics.
4 Description of ideal candidate	The announced postdoctoral position demands: Background in electrical engineering or applied physics. Fluent English with significant experience in writing scientific texts. Solid skills in MATLAB and LaTeX. Solid knowledge of theory of electromagnetic field, including techniques of computational electromagnetism. Good knowledge of linear passive time-invariant systems. Good understanding of the basic mechanisms underlying heuristic, combinatorial, and convex optimization procedures.

Mentor

Miloslav Čapek	CTU FEE	Dept. of Electromagnetic Field	miloslav.capek@fel.cvut.cz

Salary: CZK 75 000 per month

CTU Global Postdoc Fellowship

Research topic #3-6

1 Topic	Multiple MIMO optical camera communication based sensor network
2 Link to topic / project page	https://elmag.fel.cvut.cz/en/research-groups/optics/ under cooperation with partners from European project COST Action CA19111 NEWFOCUS https://www.newfocus-cost.eu/action/
3 Short description of topic	Optical camera communication (OCC) can be considered a convenient and versatile communication technology within the framework of optical wireless communications. OCC is a pragmatic version of Visible Light Communication (VLC, LiFi) based on a smart device camera that allows easier implementation of various services in smart devices. OCC can be a more favourable solution in indoor environments and for outdoor. Camera allows to detect signal from multiple transmitters at once allowing multiple input multiple output (MIMO) communication. The main task will be to develop multiple MIMO OCC technology with using multiple MIMO channels in terms number of transmitters and cameras for indoor and outdoor sensor networks with focus on mitigation of propagation/channel impairments, atmospheric influences, advanced image processing techniques and implementation using mobiles and industrial cameras
4 Description of ideal candidate	Candidate should - Research within visible light communications, processing images from cameras, research in OCC is advantage - have more than 5 impact journal papers as a main author, - h-index equal or higher than 5, - early stage researcher with maximum 3 years after the defense of PhD (expected to have PhD with start of the postdoc) - have PhD from different institution than MSc

Mentor

Stanislav Zvánovec	Faculty of electrical Engineering	Department of Electromagnetic Field	xzvanove@fel.cvut.cz

Salary: CZK 70 000 per month

CTU Global Postdoc Fellowship

Research topic #3-7

1 Topic	Research on Fusion of Optical and Data Networking and Communications and Sensing with Modern Quantum Technology
2 Link to topic / project page	There is no home current dedicated Web page specifically for this theme as this is very new brand for CTU
3 Short description of topic	The objective of this activity is research in the field of quantum technologies specifically for telecommunications, security and later in the field of quantum sensing. The research work is mainly focused on the development of quantum network architectures, quantum encryption, quantum repeaters and related protocols and their interconnection and blending with prospective quantum computers and the classical electronics.
4 Description of ideal candidate	The candidate should also have basic knowledge of physics as well as communication protocols, fiber or free space optic systems, general photonics, electronics and programming.

Mentor

Leoš Boháč	FEL	Telecommunication (K13132)	bohac@fel.cvut.cz

Salary: CZK 80 000 per month

CTU Global Postdoc Fellowship

Research topic #3-8

1 Topic	Detection of magnetic objects using gradient methods
2 Link to topic / project page	https://maglab.fel.cvut.cz/research/detection-of-magnetic-objects-using-gradient-methods/
3 Short description of topic	Measurement methods using magnetic gradient are useful in many application areas, including detection of vehicles, detection of metallic objects (arms, unexploded ordnance), perimeter protection, geomagnetic data cleaning and denoising, etc. Much of current research worldwide is focused on advanced data processing of full tensor magnetic data and/or higher gradient tensor data e.g. for improved target positioning estimation. Our research shall focus on improving positioning estimation accuracy and reliability.
4 Description of ideal candidate	Candidate should hold PhD in physics and strong background in magnetic sensing techniques or vice versa.

Mentor

Antonín Platil	Faculty of electrical engineering	Department of measurement	platil@fel.cvut.cz

Salary: CZK 61 000 per month

Research topic #3-9

1 Topic	Analysis and degradation of electrotechnical devices / OHK3
2 Link to topic / project page[6]	-
3 Short description of topic[7]	The research topic covers the degradation of electrotechnical devices in different environmental conditions known as aging. The electrotechnical devices will be analyzed during aging processes and the changes of the specific electrical and material properties will be evaluated after that. The condition and lifetime together with the weaknesses of the device could be predicted on the basis of this kind of test. The results of this research will be a description of the behavior of the device, respectively the description of the changes of the selected properties of the device during aging in different environments.
4 Description of ideal candidate[8]	Should have Ph.D. in electrotechnical science, experience with climatic tests, fluently English, author/co-author of several impact journals in Q1, Q2

Mentor

Karel Dušek	Faculty of electrical engineering	Electrotechnology	dusekk1@fel.cvut.cz

Salary: CZK 84 000 per month

CTU Global Postdoc Fellowship

Topics/positions available at the

Faculty of Nuclear Sciences and Physical Engineering.

Applications should be sent to: personalni@fjfi.cvut.cz

CTU Global Postdoc Fellowship

Research topic #4-1

1 Topic	Collectivity in photon-induced processes in ALICE with LHC Run 3 data
2 Link to topic / project page	http://physics.fjfi.cvut.cz/en/science-and-research?id=17:experiment-alice
3 Short description of topic	ALICE is undergoing an extensive upgrade of its systems in order to cope with the conditions in the LHC Run 3, starting in 2022. The upgraded ALICE apparatus will be able to process orders of magnitude more data than in the past allowing us to investigate characteristics of QCD, the theory of strong interactions, with more precision and in new ways. The candidate will study particle correlations in photon induced reactions in order to shed light on the origin of collective behaviour, a signature of the quark-gluon plasma, that has been recently observed in collisions of systems where the formation of such state of matter is not expected. Our group is heavily involved in two detector projects, FDD and MFT, which will be very important to perform this measurement; thus, the candidate will also participate in their commissioning and operation.
4 Description of ideal candidate	The applicant has a Ph. D. in experimental high-energy physics, preferably with experience in ALICE or RHIC. The applicant has a good knowledge of English, both written and spoken. Prior experience with detectors and/or in the electronics related to them is welcomed. Programming skills in C++ are required.

Mentor

Jesús Guillermo Contreras Nuño	Faculty of Nuclear Sciences and Physical Engineering	Department of Physics	guillermo.contreras.nuno@fjfi.cvut.cz

Salary: CZK 62 500 per month

CTU Global Postdoc Fellowship

Research topic #4-2

1 Topic	Integration of advanced plasma tomography into the new PlasmaLab@CTU
2 Link to topic / project page	
3 Short description of topic	The main goal is to lead the postdoc to become an active researcher in the field of plasma tomography; in particular, to implement and develop the existing know-how (Minimum Fisher Regularisation Python package) at the Department of Physics, to tokamak GOLEM research (reconstruction from two fast matrix cameras) and possibly to other plasmas that can be researched here, and to contribute to physical interpretation of results.
4 Description of ideal candidate	The ideal candidate is strongly interested and expertised in data analyses using modern Python programming environment. S(he) is willing to share and develop his/her expertise with other team members involved in our research and willing to present the new results abroad – and publish.

Mentor

Jan Mlynář	FNSPE	Physics	Jan.mlynar@fjfi.cvut.cz

Salary: CZK 62 500 per month

CTU Global Postdoc Fellowship

Research topic #4-3

1 Topic	Synchronization and collective phenomena in network-based quantum dynamical models.
2 Link to topic / project page	http://phys.cz/en/q3
3 Short description of topic	The faculty and team: The Faculty of Nuclear Sciences and Physical Engineering of the Czech Technical University is a leading research and education institution in physics, activities covering quantum technologies, high-energy physics, and mathematical physics. It is also the only institution in the region offering a full master's program in Quantum Technologies. The research group Q3, led by Prof. Igor Jex, is an active and ambitious team with many international connections both in theory and experiments. It is a pioneering group in the study of quantum networks and its applications, such as the theory and implementation of quantum walks and the formulation of the Gaussian Boson Sampling problem. The subject of the project: Mutually interconnected quantum systems attended by complex evolution constitute the basis of advanced quantum technologies. In this context, the collective dynamics arising from a system of identical quantum systems forming a network with local interactions provides a theoretical playground where the study of emerging complex phenomena remains tractable, and hence allows for a detailed analysis of the collective phenomena expected in real-world scenarios. The project focuses on exploring fundamental properties and applications of quantum dynamical network models, such as mutual synchronization of local evolutions, quantum transport and quantum simulations. Tasks of the candidate: Theoretical studies of quantum dynamical networks including spin networks, quantum walks or other dynamical models using the tools of open quantum dynamics such as quantum Markov processes, graph theory and functional analysis, and seek applications in the context of quantum technologies and quantum simulations. Interact with other team members on related topics and take part in relevant international collaborations.
4 Description of ideal candidate	The ideal candidate is expected to have a strong background in quantum physics and expertise either in the theory of open quantum systems or quantum walks and related dynamical models.

Mentor

Igor Jex	FNSPE	Physics	Igor.jex@fjfi.cvut.cz

Salary: CZK 62 500 per month

CTU Global Postdoc Fellowship

Research topic #4-4

1 Topic	Electrochemistry of Homologues of Superheavy Elements
2 Link to topic / project page	https://jaderna-chemie.cz/postdoc-2021/
3 Short description of topic	Exploration of the Super-heavy Elements (SHEs) is one of today's research frontiers that recently drew wide public attention after discoveries of four new elements. Although most chemistry investigations on SHEs use the "easier" gas-phase methodology, many fundamental properties can best be studied in liquid phase. After preliminary test in 2016, a new joint Czech Technical University (CTU) – University of Oslo – Nuclear Physics Institute SHE laboratory was set-up at the U-120M cyclotron beamline in Řež (Czechia) in 2017/2018. The laboratory is equipped with a new Modular Robotic Gas-Jet Target System (MARGE) and a microfluidic liquid-liquid extraction (LLX) system developed at the CTU. The main focus of the new lab is on the chemistry of SHE homologues and on building an on-line versatile fast microfluidic aqueous chemistry apparatus. The topic of the proposed post-doctoral research will focus on electrochemistry of the homologues of transfermium actinoids and transactinoids. Main attention will be paid to the study of redox behaviour of Mo and W, as homologues for element Sg (Z=106), Tl and In, as homologues for element Nh (Z=113), and selected lanthanoids as models for the transfermium actinoids Md, No and Lr. The overall aim is to develop a system where the redox behaviour of seaborgium, nihonium and/or transfermium actinoids can be studied by observing the changes in liquid-liquid extraction (LLE) behaviour as a function of reduction potential in an electrochemical cell prior to the extraction stage. This approach is proposed since ordinary electrochemical approaches such as cyclic voltammetry are not available for the single-atom chemistry. Thus, one needs to investigate redox properties of the heaviest elements based on partition behaviour of the single atoms between two phases instead of measurement of electric currents arising from a redox reaction. For these studies a dedicated flow-through electrochemical cell will be developed for the initial stage of the project that should be later miniaturized for application in micro- or minifluidic systems. When applied to the target SHEs, these oxidation-reduction studies are expected to give valuable information on e.g. valence electron states. However, prior to performing very costly and time-consuming studies with the SHEs, the experimental techniques, devices and chemical hypotheses will be tested using SHE homologues that can be produced with smaller accelerators, e.g. the U-120M accelerator in Nuclear Physics Institute ASCR in Rez (NPI Rez) where the laboratory is hosted. Contrary to using long-lived tracers for "off-line" experiments, the small accelerator delivers radionuclides "on-line" identically to how the SHEs will be delivered. The project proposed here will be fundamental for strengthening the established collaboration in Europe for resurrecting research on liquid phase in the field of SHE chemistry and prepare background data for actual experiments in one of the SHE laboratories. *References to CTU publications:* 1. JOHN, J. Chemistry of Superheavy Elements – Test of the Limits of Validity of the Periodic Law. *Chemické listy*. 2019, **113**(4), 205-215. ISSN 0009-2770. 2. BARTL, P., et al. Microfluidic studies of SHE homologues in new facility at NPI REZ. *Czech Chemical Society Symposium Series*. 2018, **16**(2), 268. ISSN 2336-7202.

	3. J.P. Omtvedt, NPI in Rez - New Site for Performing SHE-homologue Experiments. In: *Contributions*. TASCA 17, 16th Workshop on Recoil Separator for Superheavy Element Chemistry, Darmstadt, 2017-09-01. Darmstadt: GSI Darmstadt, 2017. 4. ČUBOVÁ, K., et al. Extraction of thallium and indium isotopes as the homologues of nihonium into the ionic liquids. *Journal of Radioanalytical and Nuclear Chemistry*. 2018, **318**(3), 2455-2461. ISSN 0236-5731. DOI 10.1007/s10967-018-6270-x. 5. BARTL, P., et al. Fast microfluidic extraction of Sg homologues at new joint CTU, UiO and NPI facility in Rez (CZE). In: *Book of Abstracts*. 6th International Conference on the Chemistry and Physics of the Transactinide Elements, Wilhelmshaven, 2019-08-25/2019-08-30. Darmstadt: GSI Darmstadt, 2019. 6. BARTL, P., et al. Rychlá kapalinová extrakce homologů seaborgia. *Czech Chemical Society Symposium Series*. 2020, **18**(3), 150. ISSN 2336-7202. 7. TERESHATOV, E.E., et al. Valence states of cyclotron-produced thallium. *New Journal of Chemistry*. 2021, **45**(7), 3377-3381. ISSN 1144-0546. DOI 10.1039/d0nj05198e.
4 Description of ideal candidate	The ideal candidate must hold a PhD in chemistry. They should have a good background in nuclear and radiochemistry, working knowledge of electrochemistry, and practical hands-on experience from the work in a radiochemical laboratory. Experience with the work at particle accelerators will be an advantage.

Mentor

Jan John	Faculty of Nuclear Sciences and Physical Engineering	Department of Nuclear Chemistry	john@fjfi.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #4-5

1 Topic	New challenges for spectral theory: geometry, artificial materials and complex fields
2 Link to topic / project page	http://nsa.fjfi.cvut.cz/david/EXPRO.html
3 Short description of topic	The ultimate goal of the project is to develop unconventional tools in spectral theory in order to tackle various newly born, or more classical but recently revived, open problems in mathematics and physics. Among the variety of problems, we intend to particularly consider hot open questions in: spectral geometry of optimal shapes and eigenfunction properties; mathematical models of modern nanostructures, graphene and metamaterials; new concepts in quantum mechanics with non-self-adjoint operators, Schrödinger and Dirac operators with complex potentials, damped wave systems, non-standard stochastic processes and asymptotic distribution of eigenvalues of structured matrices.
4 Description of ideal candidate	Applicants should have a PhD in Mathematics or Theoretical Physics (or equivalent) obtained preferably after January 1, 2013. They must show very strong research promise in at least one of the following research domains: geometric analysis, spectral theory, partial differential equations, semiclassical analysis. Previous experience in the area of the project is an advantage but not necessary.

Mentor

David Krejčiřík	Faculty of Nuclear Sciences and Physical Engineering, CTU in Prague	Mathematics	David.Krejcirik@fjfi.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Topics/positions available at the

Faculty of Architecture

Applications should be sent to:

dagmar.vopatkova@fa.cvut.cz

or

Fakulta architektury CVUT

p. Dagmar Vopátková

Thákurova 9

166 34 Praha 6

Czech Republic

Research topic #5-1

1 Topic	Design Computing
2 Link to topic / project page	
3 Short description of topic	Design computing is a multi-disciplinary field that combines research from architecture, design theory, cognitive science, computer science, artificial intelligence, design methodology, and philosophy. It looks at design from various perspectives: the process, the tools, and the knowledge required to design, and investigates the potential impact of advanced computational techniques on these aspects.
4 Description of ideal candidate	The ideal candidate has a keen interest mainly in architectural design, but experience and knowledge from other engineering design fields is also welcome. The candidate should be able to create digital and physical prototypes (for example Processing or Arduino). (s)He has knowledge of contemporary computational design techniques and practices of architects.

Mentor

Henri, Achten	Faculty of architecture	Department of architectural modelling	Henri.hubertus.achten@cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #5-2

1 Topic	Postwar Architecture in Central/Eastern Europe
2 Link to topic / project page	http://www.architektura80.cz/.home http://povalecnaarchitektura.cz/ https://www.facebook.com/seminarDA/
3 Short description of topic	Post-war architecture in Central/Eastern Europe underwent dramatic changes which faithfully reflected the internal political developments and processes. The research on related topics is still in its infancy and some subtopics should be developed: mainly social and local context, relations to particular state economy and long term political strategies, cooperation between architects and structural engineers or artists, local versus global artistic approach etc.
4 Description of ideal candidate	Historian of Architecture, focused on/interested in Modern Movement and its postwar transformation and advancement. The research results should take form of scientific, elaborated papers.

Mentor

Petr Vorlík	Faculty of Architecture	Department of Theory and History of Architecture	vorlik@fa.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Topics/positions available at the

Faculty of Transportation Sciences

Applications should be sent to:

vyzkum@fd.cvut.cz

or

Fakulta dopravní ČVUT

p. Markéta Ředinová

Konviktská 20

110 00 Praha 1

Czech Republic

CTU Global Postdoc Fellowship

Research topic #6-1

1 Topic	Digital Twin of Sustainable and Resilient Urban Area
2 Link to topic / project page	https://gatetoeurope.eu/
3 Short description of topic	Management of Smart Resilient City can use a variety of sensors, starting with physical detectors, cameras, and ending with space imaging (weather prediction, city temperature maps, and emission maps). It should be noted that even a vehicle or a mobile phone in this concept becomes an intelligent sensor providing important data. City management, thanks to current data, moves from the original predefined dynamic plans to adaptive control algorithms that ensure the coordination of entire territorial units. Different simulation tools are used to validate individual strategies. In virtual space, it is much easier to model responses to different types of extraordinary events. Verified strategies can then be projected into real-estate management through actuators, which may be both physical infrastructure facilities and navigation or assistance services, and prospective operation of autonomous systems such as unmanned vehicles.
4 Description of ideal candidate	The candidate should have advanced knowledge of cybernetics and artificial intelligence, the principles of cyber-physical systems, data interface programming and the creation of simulation and modeling tools, including the use of virtual and augmented reality.

Mentor

Miroslav Svítek	Faculty of Transportation Sciences	Department of Transport Telematics	svitek@fd.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #6-2

1 Topic	Computational Impact Dynamics of 3D Metal Printed Structures for Applications in Transportation
2 Link to topic / project page	https://www.researchgate.net/project/Impact-behaviour-of-3D-metal-printed-structures
3 Short description of topic	We are seeking a highly talented and motivated researcher to work within our impact dynamics group oriented at experimental and numerical investigation of mechanical response of 3D printed metamaterials (SLS printed stainless steel, aluminum alloys, titanium alloys) at high rates of strain. The aim of the project is to develop a new constitutive model for Finite Element modelling of yielding and failure of 3D printed metamaterials which would allow for FE simulations of impact under moderate and high strain rates. The holder of the postdoc position will be a member of a strong research group of young and highly motivated scientists, mainly PhD students and young postdocs.
4 Description of ideal candidate	The candidate is expected to hold a doctorate in engineering, materials science, mathematics, physics or a related discipline; or, alternatively, have a good first degree and/or significant relevant industrial experience. Experience with SHPB (Split Hopkinson Pressure Bar) experimental technique for characterization of the behavior of materials at high strain rates and/or evaluation of measured data for constitutive modelling is advantageous. Aside the constitutive modelling and FE simulations you will be expected to analyze and interpret high strain rate and gas gun experiments. Knowledge in material modelling, data acquisition systems, development of novel diagnostics and apparatuses in experimental mechanics, temperature and environmental conditioning of materials is also beneficial.

Mentor

Ondřej Jiroušek	Faculty of Transportation Sciences	Department of Mechanics and Materials	jirousek@fd.cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Research topic #6-3

1 Topic	Project "Human-Machine Interaction in Transportation"
2 Link to topic / project page	K616.fd.cvut.cz www.dsrg.eu
3 Short description of topic	The project is aimed at human-machine interaction problems in transportation, especially human controlled vehicles (drivers, machine or complex systems operators…). The project tasks are related to several scientific areas. The main ones are neuro-informatics, human factors, programming and informatics, mathematical analysis; interactive simulation software and equipment creation (vehicle simulators and virtual reality); driver behavior assessment and psycho-physiological parameters measuring and analyzes (electroencephalogram, electrooculogram, electrocardiogram, etc.). The experimental work is done with use of modern HMI measuring devices and interactive VR simulators.
4 Description of ideal candidate	The candidate is expected to have engineering background (electrotechnics or machinery) related to land vehicles and simulations; algorithmizing and programming skills (C/C++ is highly appreciated, MATLAB and/or similar other software tools scripting). Experiences in human factors or experimental/research psychology in industrial (preferably in transportation) areas (academic degree or scientific record in this area is welcome). The candidate will work in team where an interest in novel technologies, computer graphics, VR and interactive technologies is supposed.

Mentor

Stanislav Novotný	Faculty of Transportation Sciences	Department of Vehicles	novotny@lss.fd.cvut.cz

Salary: CZK 68 000 per month

CTU Global Postdoc Fellowship

Research topic #6-4

1 Topic	Modeling travel behavior using multi-agent systems and activity-based approach
2 Link to topic / project page	http://lambda.fd.cvut.cz https://www.matsim.org/
3 Short description of topic	The topic focuses on modeling of travel behavior using multi-agent systems. This topic belongs to the field of activity-based approach to travel demand analysis. Activity-based modeling treats travel as being derived from the demand for activity participation. The focus is thus not only on modelling traffic, but activity participation of citizens. MATSim - an open-source framework for implementing large-scale agent-based transport simulations – will be used as a primary tool. MATSim is a microsimulation platform implemented as a Java application. It also adopts the activity-based approach to generate and simulate individuals' activities. Agent stands for the individual travelers, and agent behavior refers to an individual's daily activity travel plan and route choice. This topic however includes also data preparation, generation of synthetic population and generating daily plans for each citizen / agent. Additionally, so-called "scoring function", will be researched. When agents execute their plans, the plans are scored according to their economic utility. In the MATSim software, a co-evolutionary algorithm is used to obtain stochastic user equilibrium. The scoring function is needed for the co-evolutionary optimization to model impact of certain policies and decisions. MATSim has been successfully used in large projects abroad, for example in Switzerland, Germany or the USA. Its application in Czech Republic would help, especially in connection to traditional traffic simulation models, such as PTV VISUM used in the city of Prague.
4 Description of ideal candidate	• Experience with research work • International experiences • Ability to fluently communicate in English • Publication history in English • Knowledge of algorithmisation and ability to write computer programs (Java, Python, or others) • Data analysis experience (statistical analysis, logistic regression or others) • Experience with traffic microscopic simulation is an advantage

Mentor

Ondřej Přibyl	Faculty of transportation sciences	Applied mathematics	pribylo@fd.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Topics/positions available at the

Faculty of Biomedical Engineering

Applications should be sent to:

FBMI CVUT

p. Renata Horňáková

nám. Sítná 3105

272 01 Kladno

Czech Republic

CTU Global Postdoc Fellowship

Research topic #7-1

1 Topic	Respiratory technology, research and intensive care
2 Link to topic / project page	https://ventilation.fbmi.cvut.cz/
3 Short description of topic	Our research group is interested in all aspects of mechanical ventilation including theoretical analyses, modeling, design of respiratory care equipment, animal experiments, and clinical trials. Our research also covers topics from related areas of critical and intensive care medicine. The primary work will involve design and management of research experiments and experimental data processing and analysis. The successful candidate is also expected to write journal and conference papers and mentor students in research.
4 Description of ideal candidate	The candidate should have experience with biomedical signal or image processing and analysis, good software programming skills in Matlab, C, or similar. Background in one or more of the following areas: respiratory care, biomedical instrumentation, statistics, fluid mechanics, or control engineering. Skills in writing and publishing research papers indexed in Web of Science, excellent English communication skills.

Mentor

Karel Roubík, prof. Ing., Ph.D.	Fac. of Biomedical Engineering	Dep. of Biomedical Technology	roubik@fbmi.cvut.cz

Salary: CZK 61 700 per month

CTU Global Postdoc Fellowship

Research topic #7-2

1 Topic	Disorders of gait, postural stability and cognition in Parkinson's disease
2 Link to topic / project page	https://starfos.tacr.cz/cs/project/NU20-04-00327
3 Short description of topic	Disorders of gait and stability gradually reduce quality of life in patients with Parkinson's disease (PD) and other synucleinopathies. Along with cognitive deficiency, in advanced PD they become the main survival limits, whereas dementia with Lewy bodies produces cognitive impairment from the onset of the disease. However, in the premotor stages of synucleinopathies, ie. in subjects with idiopathic REM sleep disorder (iRBD), the impairment of gait, stability and cognition is not evident at standard clinical examination. In this project, we plan to prospectively test patients with iRBD and patients with fully blown PD. We will look at the interrelationships between gait and cognitive disorders and their morphological and functional correlates, which will contribute to better understanding of the mechanisms of disability and allow for an earlier differentiation of clinical forms of synucleinopathies. In addition, in patients with advanced PD, we will test new procedures of cognitive rehabilitation, which can improve not only cognitive functions, but also gait and stability.
4 Description of ideal candidate	PhD at least five papers accepted for publication in a journal with relevant Impact Factor related to research field/topic (data analysis of instrumented timed Up & Go test). Over that, programming skills.

Mentor

Zoltán Szabó	Faculty of Biomedical Engineering	Department of Biomedical Informatics	szabo@fbmi.cvut.cz

Salary: CZK 61 700 per month

CTU Global Postdoc Fellowship

Research topic #7-3

1 Topic	Applications of EM fields in medical diagnostics and therapy
2 Link to topic / project page	https://bioem.fbmi.cvut.cz/doku.php/en/start
3 Short descriptions of topic	Our research team is primarily involved in the design of methods and instrumentation for medical therapy and diagnostics based on the interaction of electromagnetic fields with biological tissues. The main therapeutic application that this team is dedicated to is the so-called microwave hyperthermia, which is successfully used to treat cancer. The main diagnostic applications include microwave non-invasive temperature monitoring during thermotherapy, blood glucose monitoring, and detection and classification of strokes. The candidate will be involved in one of the above areas in the design of reconstruction algorithms, antenna elements, imaging or hyperthermic systems, treatment planning algorithms, amplifier design, permittivity measurement, etc.
4 Description of ideal candidate	The candidate should have a solid knowledge in electromagnetic field theory and experience with numerical simulation tolls. The candidate is going to be heavily involved in the preparation of journal manuscripts. Terefore, we expect the candidate to co-author at least three manuscripts accepted for publication in a journal indexed in the Web of Science or Scopus.

Mentor

Jan Vrba, Assoc. Prof., Dr.-Ing.	Faculty of Biomedical Engineering	Dept. of Biomedical Technologies	jan.vrba@fbmi.cvut.cz

Salary: CZK 61 700 per month

CTU Global Postdoc Fellowship

Topics/positions available at the

Faculty of Information Technology

Applications should be sent to:

Office of Science and Research
CTU in Prague, Faculty of Information Technology
Thákurova 9
160 00 Prague 6, Czech Republic

E-mail: research@fit.cvut.cz

CTU Global Postdoc Fellowship

Research topic #8-1

1 Topic	Big Data in Astroinformatics
2 Link to project page	https://users.fit.cvut.cz/~tvrdik/#projects
3 Short description of topic	Modern astronomy has undergone a true paradigmatic shift from hypothesis-driven science focused on investigation of a single class of objects to the data-driven research based on explorative analysis of petabyte-scaled surveys of the Universe. Current astronomical high-performance digital detectors in observatories generate petabytes of raw data per night. The data is pan-spectral, ranging from radio through visible light to X-ray and gamma-ray frequencies, New domains are emerging, such as particle astrophysics (neutrinos) and gravitational-wave astronomy. Most of astronomical data are publicly available through sophisticated networks of federated interoperable data archives based on the same standards for data storage, query and transfer called Astronomical Virtual Observatory. Requirements to pre-process, store, and analyze this big data pushed the current information technology to its true limits. High-throughput pre-processing algorithms based on massively parallel GPU platforms using workflow orchestration systems such as Dask or Spark for distributed processing are needed to reduce the amount of stored data to sustainable size. Advanced visualisation tools became a part of many astronomical projects and result in increasing amount of multimedia content in on-line volumes of major astronomical refereed journals. Heterogeneity, multidimensionality, and sparsity of more and more complex astronomical datasets need special storage formats (e.g., Parquet, HDF5, ASDF) for rapid searching, filtering, and data mining. Astronomical analysis of big sky surveys has recently been done in distributed cloud environments called Science platforms (e.g., SciServer, Astro Data Lab) where interactive data mining and visualisation experiments are done through dedicated web GUI or in Jupyter Hub directly launched in data centers storing Big Data archives. We are developing a special hierarchical semi-sparse cube architecture to store such data. Our aim is to facilitate processing of these data using cutting-edge technologies, such as Map-Reduce frameworks, GPU-accelerated farms, or HPC supercomputers. Our research group closely cooperates with teams representing large-scale astroinformatics projects, such as IVOA, LSST, or Heidelberg Institute for Theoretical Studies. We are seeking an enthusiastic researcher with computer science background interested in astronomy to work on the design of the hierarchical cube architecture and processing pipelines scalable to petabyte volumes.

4 Description of ideal candidate	A candidate should have a solid background in algorithms and data structures, database and networking technologies, parallel and distributed algorithms, and should have programming skills in Python, C, and experience with big data frameworks (Map-Reduce, Spark, Dask…). Basic knowledge of cloud environment using Docker, JupyterHub, JupyterLab or Google Colab, and interest in astronomy is an asset.

prof. Pavel Tvrdik	F. of Information Technology	D. of Computer Systems	tvrdik@fit.cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Research topic #8-2

1 Topic	Multi-agent Path Finding
2 Link to topic / project page	http://mapf.info, https://users.fit.cvut.cz/surynpav/roboage
3 Short description of topic	Multi-agent path finding (MAPF) is a problem of navigating multiple agents to their individual goal positions so that agents do not collide. The problem has been intensively studied recently from the perspective of heuristic search. However, there are still open questions especially in compilation-based approaches to MAPF and in how to reflect properties of real environments such a continuity of space and time in formal models of MAPF. Tests of novel concepts on real robots in a laboratory is an optional part of this research.
4 Description of ideal candidate	The ideal candidate should actively publish in artificial intelligence venues (AAAI, IJCAI, …) and/or in specialized venues focused on planning, heuristic search (ICAPS, AAMAS, SoCS, …), or robotics (ICRA, IROS, …) and in related journals. Strong programming skills preferably in C/C++ are required.

Pavel Surynek	Faculty of Information Technology	Department of Applied Mathematics	pavel.surynek@fit.cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Research topic #8-3

1 Topic	Parameterized and exact algorithms
2 Link to topic / project page	https://users.fit.cvut.cz/~suchyon7/ggoat/uni_supp_postdoc
3 Short description of topic	Parameterized or multivariate analysis became in the last two decades a standard approach for (NP-) hard computational problems. Here, in contrast to classical complexity, the efficiency of algorithms is not measured only with respect to the length of the input instance, but also with respect to a specified parameter. The outcome is a more fine grained complexity landscape which allows for a better prediction of the complexity of particular instances encountered. The goal is to design algorithms with running time that is polynomial in the input size and exponential only in the designated parameter. Fundamentally, the degree of the polynomial is required to be independent of the value of the parameter. Parameterized complexity provides a mathematical framework to analyze these algorithms and also to show that for some problems and parameters there is (probably) no such algorithm.
4 Description of ideal candidate	be familiar with several of the following areas: Parameterized complexity, integer linear programming, structural graph theory, game theory, computational social choice. Experience in optimization and in particular approximation algorithms or hardness of approximation is appreciated but not required. The candidate's high scientific potential should be witnessed by publications in the area of algorithms or discrete math in proceedings of highly ranked international conferences and/or journals.

Mentor

Ondřej, Suchý	Faculty of Information Technology	Department of Theoretical Computer Science	Ondrej.suchy@fit.cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Research topic #8-4

1 Topic	Formal Verification for Cyber-Physical Systems
2 Link to topic / project page	http://www.cs.cas.cz/~ratschan/
3 Short description of topic	Cyber-physical systems (CPS) are (as defined by the NSF) engineered systems that are built from, and depend upon, the seamless integration of computation and physical components. Since computation is currently being integrated into the vast majority of technical systems, CPS are becoming highly relevant for the technical sciences as a whole. Many CPS interact with humans, and hence the safety of such systems is of utmost importance. The postdoc will contribute to ensuring the safety of such systems by taking part in research that designs algorithms for proving the correctness, and especially, safety, of formal models of cyber-physical systems.
4 Description of ideal candidate	The ideal candidate combines the ability of formally precise reasoning and algorithm design with the familiarity with technical aspects of cyber-physical (embedded) systems.

Mentor

Stefan Ratschan	FIT	Department of Digital Design	ratscte@cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Research topic #8-5

1 Topic	Synthesis of artificial intelligence and machine learning models to programmable hardware.
2 Link to topic / project page	https://users.fit.cvut.cz/~fiserp/
3 Short description of topic	This project is focused on synthesis of models of artificial intelligence and machine learning to programmable hardware as FPGA devices. The goal of the project is to enhance frameworks such as qkeras, HLS4ML not only to limited accuracy, but also to other aspects of the design and mapping to the target platform. Tightly binding AI frameworks and logic synthesis algorithms (tools) gives the possibility of united optimization of AI models with respect to their implementation and vice versa. On the logic synthesis side, aspects as energy consumption, timing constraints, and reliability will be considered.
4 Description of ideal candidate	Have knowledge of modern algorithms from artificial intelligence, especially neural networks and deep learning, including frameworks. Python and C/C++ programming skills and experience with hardware design for programable devices as FPGA including VHDL/Verilog languages. Basic knowledge of logic synthesis and optimization algorithms.

Mentor

Petr Fišer	FIT CTU	Dept. of Digital design	fiserp@fit.cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Research topic #8-6

1 Topic	Implementation and validation of co-evolution of ontological models and domain-specific modeling languages for different domains
2 Link to topic / project page	https://ccmi.fit.cvut.cz/home
3 Short description of topic	Currently, there is a large class of domain-specific domain modeling languages. However, since the subject area tends to evolve over time, developers have to complicate the DSML as well. As a result, DSML loses its flexibility and usability. The use of various, highly specialized dialects of DSML, reflecting various aspects of the subject area, but consistent with each other, seems to be much more effective. The use of ontologies and corresponding formal mathematical models when creating them can be used to ensure the consistency of different dialects of DSML. This is possible, since the DSML is based on a domain model, which can be an ontology. The main goal of the research proposed is to propose new formal mathematical models and algorithmic mechanisms for describing and organizing coordinated changes to the ontology and related DSML without the need to re-create the entire structure of the DSML in a certain application domain.
4 Description of ideal candidate	have experience in the development of DSML (and / or DSL in general), know several formal methods for DSML semantics specification (invariants theory, applied category theory, graph theory) know the basic principles of conceptual modeling and developing domain ontologies, know the principles of plugin development for modern modeling platforms (Eclipse, Sparx Enterprise Architect), be able to implement model transformations.

Mentor

Robert Pergl	Faculty of Information Technology	Dept. of Software Engineering	perglr@fit.cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Research topic #8-7

1 Topic	Cryptanalysis of Post-Quantum Schemes
2 Link to topic / project page	https://crypto.fit.cvut.cz/
3 Short description of topic	With the dawn of quantum computing, many of contemporary algorithms our security depends on are becoming insufficient. As of today, new candidate algorithms for post-quantum security are being put under scrutiny, bringing many new challenges in cryptology and engineering fields. Requirements necessary for assuring security in the post-quantum era are even more complex, considering not only confidentiality, but also authentication, data integrity, availability and more. Research in this topic will be focused on methods of cryptanalysis of state-of-the-art post-quantum schemes, side-channel attack countermeasures, and quantitative and qualitative evaluation of these countermeasures.
4 Description of ideal candidate	Ideal candidate should have strong background in cryptology, mathematics and cryptographic engineering. The candidate shall have thorough overview of implementation attacks and related knowledge of statistical methods. The candidate should also have an experience with FPGA design and/or programming of embedded systems.

Mentor

Martin Novotný	FIT CTU	Dept. of Digital design	novotnym@fit.cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Research topic #8-8

1 Topic	Design of PUFs and TRNGs and evaluation of their resistance against attacks
2 Link to topic / project page	https://fit.cvut.cz/cs/fakulta/lide/5235-robert-lorencz
3 Short description of topic	State-of-the-art hardware components of cryptographic systems require quality true random number generators (TRNG). Reliable key generators that are based on physical unclonable functions (PUF) are also in demand. Such key generation is very desirable from a security point of view because the key generated in this way remains the "secret" of the hardware itself. It is also important to study the behavior of the proposed PUFs and TRNGs in terms of their long-term response stability (in case of TRNG, entropy). The aim is to design new PUF and TRNG architectures that are suitable for the purpose of generation of quality TRNG output that also guarantee stable key generation based on PUF responses. This also includes studying and understanding the behavior of these components at the statistical level as well as at the physical/technological level. The security of designed solutions needs to be tested for resistance to known attacks. Therefore, part of the research is the investigation of new possibilities of combining active and passive physical attacks with the usage of classical cryptanalysis (linear, differential, algebraic).
4 Description of ideal candidate	An ideal candidate should have defended a Ph.D. thesis in the field of hardware security. Knowledge in cryptographic key generation and storage in hardware, hardware side-channel attacks, and basic knowledge of TRNG and PUF is expected. Experience in implementation of TRNG and/or PUF circuits in FPGA or ASIC is an advantage.

Mentor

Róbert Lórencz	FIT CTU in Prague	Department of Information Security	lorencz@cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Research topic #8-9

1 Topic	Kernelization in Computational Social Choice
2 Link to topic / project page	https://users.fit.cvut.cz/~knopdusa/postdoc22.html
3 Short description of topic	Fixed-parameter tractability and approximation algorithms are nowadays standard tools for design of algorithms for hard problems in the area of Computational Social Choice. Surprisingly, kernelization, a prominent technique in FPT algorithmics, is not used as often to tackle social choice problems. Kernelization is a formalism of safe data reduction which we believe does have its place in all research disciplines dealing with large and complex datasets. The most recent approach is the so-called lossy kernelization which on the one hand cooperates with approximation algorithms (unlike kernelization which can only be pipelined with exact algorithms) and on the other hand, allows circumventing hardness results (in exchange for introducing a possible loss in the quality of the solution).
4 Description of ideal candidate	be familiar with several of the following areas: Parameterized complexity, integer linear programming, structural graph theory, game theory, computational social choice. Experience in optimization and in particular approximation algorithms or hardness of approximation is appreciated but not required. The candidate's high scientific potential should be witnessed by publications in the area of algorithms or discrete math in proceedings of highly ranked international conferences and/or journals.

Mentor

Dušan, Knop	Faculty of Information Technology	Department of Theoretical Computer Science	dusan.knop@fit.cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Topics/positions available at the

Klokner Institute

Applications should be sent to:

klara.machalicka@cvut.cz

or

Kloknerův ústav ČVUT

Attn: ing. Klára Vokáč-Machalická, Ph.D.

Šolínova 7

166 08 Praha 6

Czech Republic

CTU Global Postdoc Fellowship

Research topic #9-1

1 Topic	Environmental aging and durability of polymers with special focus on fiber composites with matrix reinforced with nanoparticles
2 Link to topic / project page	-
3 Short description of topic	Durability of polymers, used for adhesive joints or for matrix of fiber composites, is crucial for their applications. Mechanical properties can be seriously affected by the environmental parameters, such as temperature, humidity or UV radiation, and degradation can be increased by simultaneous action of mechanical stress. The main idea for the research activity is characterization of the environmental durability of fiber composites with matrix reinforced with nanoparticles, their mechanical properties and hydro-thermal properties. The study of environmental degradation processes in polymer will be also focused on bonded composite joints.
4 Description of ideal candidate	- PhD in materials engineering or polymer science - A strong research background relevant to the topic described above - Published, at least, 2 papers in the Scopus/Web of Science-indexed journals in 2021 - Hirsch index - 3 plus - Research experience in materials structural and thermo-mechanical properties analyses, such as mechanical tests, FTIR DMA and DSC, is welcome

Mentor

Miroslav Vokáč	Klokner Institute	Department of Experimental Methods	miroslav.vokac@cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #9-2

1 Topic	Reliability and risk assessment of civil engineering structures considering sustainability principles
2 Link to topic / project page	- (see below)
3 Short description of topic	Current methods used to design and assess civil engineering structures lead to their unbalanced reliability and often conservative approaches compromise the principles of sustainability in construction. This is why it is important to systematically develop the methods of probabilistic reliability assessment and optimisation that make it possible to adequately describe uncertainties in structural resistance and load effects. Further, societally acceptable risk criteria need to be updated to account for the sustainability principles.
4 Description of ideal candidate	A researcher experienced in the field of reliability and risk assessment of civil engineering structures (applications of the partial factor method; probabilistic modelling of material and geometrical properties, load effects, model uncertainties, system behaviour). Having good knowledge of English, communicative. Keen to be involved in both fundamental and applied research projects, willing to disseminate results through scientific publications and participation at conferences. A candidate's experience should match with one or more research topics developed in the Klokner Institute and mainly in the Department of Structural Reliability – see http://www.klok.cvut.cz/en/about-institute/departments/department-of-structural-reliability/

Mentor

Miroslav SÝKORA	Klokner Institute	Structural Reliability	miroslav.sykora@cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Topics/positions available at the

Masaryk Institute of Advanced Studies

Applications should be sent to:

Kamila.Cernkovicova@cvut.cz

or

MÚVS ČVUT

Attn: p. Kamila Černkovičová

Kolejní 2637/2a

160 00 Praha 6

Czech Republic

CTU Global Postdoc Fellowship

Research topic #10-1

1 Topic	New project approaches to technology innovation and their implications in European companies in post-covid environment
2 Link to topic / project page	https://www.amazon.com/Technology-identification-bring-technology-innovation/dp/3639710444/ref=sr_1_2?dchild=1&keywords=jemala+marek&qid=1620370812&sr=8-2
3 Short description of topic	Currently, project innovation management is facing a more difficult and dynamic trends, mainly because of a problematic situation of many companies, stricter legislation, especially as to the environmental protection and Industry 4.0. The additional needs for crisis management, changes in production standards, digitization, pressures to change usual management methodologies and the growing demands of Industry 4.0 can be very disruptive to traditional project innovation management. Many companies will need not to pay compensation for closed operations during the covid crisis, but more targeted support programs for the development of so-called transformative innovation. These innovations are intended to transform problem companies into sustainable and competitive business. These new requirements require a more open innovation strategy, agile project management and tasks conditioned by new technological and social competencies of innovation management. In line with this development, the primary goal of this research can be focus to identify new approaches, practice, methods, skills and competencies that a project innovation management must demonstrate to succeed in a post-covid business environment. To fulfil this goal, it is necessary to analyse industrial enterprises in different regions, their business and technology innovation processes, find out what problems exist and what possibilities of technology strategies, procedures and projects can be implemented. At the same time, it is important to identify the important roles of government institutions, regional chambers of commerce, industry associations, or business parks in this environment. The result of this research should be in recommendations for improving technology innovation processes at the business level, but also for mezzo and macro institutions.
4 Description of ideal candidate	He/She should graduate (PhDor equivalent) from a study program focused on economics and management, innovation management, technology management, project management etc. and publish at least 2 articles in a journal with relevant Impact Factor

Mentor

Doc. Ing. Marek Jemala, Ph.D.	MÚVS ČVUT/ MIAS CTU	Institut ekonomických studií	Marek.Jemala@cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Research topic #10-2

1 Topic	Teaching Methodology in the Post-pandemic education and Role of ICT in Education
2 Link to topic / project page	Communicate directly to mentor
3 Short description of topic	Digital technologies and distance forms of teaching changed the form of the educational process during the pandemic: the e-learning environment developed rapidly, new possibilities for learning interactions and management of the learning process emerged. However, teachers remained the main actors in these processes. In the sudden transformation of the teaching environment, they were still responsible for the required high degree of technical expertise, but their demands on the ability to use digital technologies have increased dramatically, although they are not - unlike current students - "digital natives". The main objective is to conduct innovative research in the field of teaching methodologies and the role of ICT in education. Proposed research topic will be derived from the area of eye tracking methods, various types of sensors, audiovisual data, etc. Technical assistance (measuring technologies and applications of virtual and augmented reality) to be offered by the ŠKODA AUTO a.s. The use of qualitative and quantitative analysis, statistical software tools such as SPSS is expected and appreciated. This position is located at the CTU in Prague.
4 Description of ideal candidate	He/She should be PhD graduate or equivalent degree from a study program focused on Education Sciences, Teaching Methodology, Pedagogy, Technical Teacher Training etc. oriented on technical education

Mentor

Doc. Ing. David Vaněček, Ph.D	MÚVS ČVUT/ MIAS CTU	Institute of pedagogical studies	David.vanecek@cvut.cz

Salary: CZK 65 000 per month

CTU Global Postdoc Fellowship

Topics/positions available at the

Institute of Experimental and Applied Physics

Applications should be sent to:

martina.vanisova@utef.cvut.cz

or

ÚTEF ČVUT

Attn: p. Martina Vanišová

Husova 240/5

110 00 Praha 1

Czech Republic

CTU Global Postdoc Fellowship

Research topic #11-1

1 Topic	Development of advanced detector systems for particle identification in particle and nuclear physics experiments
2 Link to topic / project page	http://www.utef.cvut.cz/cms_files/original/cms_data/00079/PDF/Topic_description_DES_-_CTU_Future_Fund_2022.pdf
3 Short description of topic	Fundamental science applications, such as high-energy physics and space research depend on fast and reliable detector systems to identify particles and determine their energy. Hybrid pixel detectors (HPD) enabling single-particle processing are ideal since they are noiseless and can determine the time and energy of the particle interaction with high precision. The key objective of the work is to develop versatile detection systems based on the Medipix/Timepix technology as well as related data processing algorithms for particle identification and trajectory reconstruction. The developed detection systems will be used in physics experiments at the LHC at CERN (namely ATLAS and MoEDAL). The candidate will work together with an international and interdisciplinary team of physicists, computer scientists and engineers.
4 Description of ideal candidate	You are a team player with excellent communication skills and have an independent and well-structured approach to work, good organization skills, and enjoy experimental work. You have a good knowledge of written and spoken English. Knowledge and experience in the following fields are desirable: • Application-oriented nuclear physics as well as nuclear physics measurement techniques and data acquisition systems; • Setting up, executing, and analyzing nuclear and particle physics experiments, Monte Carlo simulations (e.g. Geant4, Allpix^2, MCNP); • Programming experience (e.g. C++, ROOT, python); • Data analysis in particle and nuclear physics experiments; • Interest in the application of Machine Learning.

Mentor

1 Name, surname	Benedikt, Bergmann
2 Faculty-Institute	Institute of Experimental and Applied Physics
3 Department	Department of electronics and software
4 E-mail	Benedikt.bergmann@utef.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #11-2

1 Topic	Selected topics in Astroneutrino physics
2 Link to topic / project page	http://www.utef.cvut.cz/cms_files/original/cms_data/00079/PDF/Topic_description_DTM_-_CTU_Future_Fund_2022.pdf
3 Short description of topic	The work will consist of elaborating various approaches towards extracting information about neutrino properties from astronomical and cosmological observations. Namely, the effects of photon and proton rays passing through the Cosmic neutrino background (CNB) will be studied with the goal to understand their sensitivity to neutrino mass and neutrino electromagnetic properties. In parallel various scenarios of the CNB neutrino condensation will be elaborated. The work will include actively representing the IEAP in the European Consortium of AstroParticle Theory.
4 Description of ideal candidate	The candidate should have a solid overview about the beyond-SM model building with emphasis on the neutrino sector. The candidate should be fluent in Quantum Field Theory. The candidate should have knowledge of and experience with the Finite-temperature QFT and its real-time formalism. The candidate should be able to build and to lead a small scientific group (of 2-4 scientists). The candidate should be creative and cooperative.

Mentor

1 Name, surname	Adam Smetana
2 Faculty-Institute	Institute of Experimental and Applied Physics
3 Department	Department of Theory and Modeling
4 E-mail	adam.smetana@utef.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #11-3

1 Topic	Measurement of anomalies in angular correlation of electron and positron internally produced in excited 8Be and 4He
2 Link to topic / project page	http://aladdin.utef.cvut.cz/projekty/vdg/x17/
3 Short description of topic	Theoretical prediction for the distribution of the angle between electrons and positrons originating in internal pair creations is a monotonic featureless decrease with the opening angle. Recent studies on excited states of ^{8}Be and ^{4}He nuclei, made in ATOMKI, Hungary, however, revealed deviations from this expectation. If true, such a result may have a fundamental impact: the anomaly can be explained by introducing a new short-lived neutral boson that can still fit into known experimental and theoretical constraints. Although serious work has been done on the theoretical side, an independent laboratory has not yet verified these results. However, relevant experiments are currently being prepared worldwide, now including the Institute of Experimental and Applied Physics (IEAP). A construction is ongoing of a suitable Time-Projection-Chamber-based (TPC) spectrometer for light charged particles, utilizing magnetic field as a means for energy measurement, and supplemented by a Multiwire Proportional Chambers (MWPC) and Timepix3 pixel detectors to reach unprecedented spatial and angular resolution. The goal is to either confirm or refute the above-mentioned anomaly. The detector development and testing takes place within our Van-de-Graaff accelerator facility. An important part of this research project is the Monte Carlo simulation of the experiment, which can further improve the understanding of the experimental system, namely its limits and possible artifacts, and provide better insight on the necessary steps of data reconstruction. The aim of the research position will be to perform needed simulations of the $e^{+}e^{-}$ pairs creation, possible X17-particle creation, and how the experimental system will record the events. The simulations will be based on a framework developed for this experiment. The selected candidate will use the framework, analyze its data and further develop the existing tools.
4 Description of ideal candidate	The candidate should be familiar with Monte Carlo simulation tools, such as GEANT4 and/or similar. Good collaboration skills will be valued, as he will work in close interaction with theoretical, experimental and instrumentation physicists.

Mentor

1 Name, surname	Rudolf Sýkora & Hugo Natal da Luz (co-supervision)
2 Faculty-Institute	Institute of Experimental and Applied Physics (IEAP)
3 Department	Experimental Physics / Van de Graaff accelerator
4 E-mail	rudolf.sykora@cvut.cz hugo.nluz@cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Research topic #11-4

1 Topic	High resolution X-ray imaging
2 Link to topic / project page	http://www.utef.cvut.cz/cms_files/original/cms_data/00079/PDF/Topic_description_DAPT_-_CTU_Future_Fund_2022.pdf
3 Short description of topic	The candidate should concentrate on development of detection and spectrometric systems and methods for new hybrid pixel detectors and applications such as 2D and 3D high-resolution imaging at the micro and nano scale. The application areas vary from material sciences through cultural heritage to preclinical research.
4 Description of ideal candidate	We are looking for a candidate with expertise in radiation imaging techniques and laboratory systems operation. Programming skills in Python will be an advantage, the use of image processing and analysis tools (Matlab) will be emphasized. The candidate should be: • Motivated and able to engage in interdisciplinary collaboration. • Have good communication and networking skills. • A team player, able to convert meeting minutes into action. • Proactive and forthcoming, and able to work independently.

Mentor

1 Name, surname	Jan Žemlička
2 Faculty-Institute	Institute of Experimental and Applied Physics
3 Department	Applied Physics and Technology
4 E-mail	Jan.Zemlicka@utef.cvut.cz

Salary: CZK 62 000 per month

CTU Global Postdoc Fellowship

Topics/positions available at the

Czech Institute of Informatics, Robotics and Cybernetics

Applications should be sent to:

Katerina.Hanzalova@cvut.cz

or

CIIRC CVUT

Attn: Mgr. Kateřina Hanzalová

Jugoslávských partyzánů 1580/3

160 00 Praha 6

Czech Republic

CTU Global Postdoc Fellowship

Research topic #12-1

1 Topic	Data-driven Scheduling Algorithms
2 Link to topic / project page	https://iid.ciirc.cvut.cz/
3 Short description of topic	This project starts by observing that current time-triggered embedded real-time systems (such as those in automated cars) are too rigid. They fail to account for the evolution in a system's configuration during its life-cycle while potentially having uncertainty in the parameters or incomplete specification requirements. For such a safety-critical system, we propose new scheduling techniques to allocate individual computation and communication jobs on hardware resources in time. Given the problem complexity, the scheduling algorithms have to be scalable to solve instances with thousands of jobs and handle uncertain parameters and constraints. We aim to enhance our algorithms' search strategy with the information extracted from the related scheduling problems and instances. Furthermore, we aim to use machine learning techniques to automate the schedule adaptation needed for the correct system operation. The objective of this post-doc project is to - formulate new scheduling problems for evolvable systems - derive their fundamental mathematical properties - apply Machine Learning to automate the search and adaptation - design, implement and evaluate new scheduling algorithms
4 Description of ideal candidate	We are looking for the candidate with strong background in operations research and scheduling. The candidate should be able to carry independent research work and have a proven track-record of publications in the top journals in the field (European Journal of Operational Research, Computers and Operations Research, IEEE Transactions on Computers/Communications). The candidate should provide research statement describing his/her research interests, achievements, and goals.

Mentor

Zdeněk Hanzálek	CIIRC	IID	Zdenek.hanzalek@cvut.cz

Salary: CZK 70 000 per month

CTU Global Postdoc Fellowship

Research topic #12-2

1 Topic	Advanced machine learning approach to optimization of evaluation criteria in neuropsychological assessment
2 Link to topic / project page	Not yet disclosed
3 Short description of topic	The project focuses on temporal context aware approaches in semi-supervised learning. We hypothesize that the utilization of the contextual information within the query selection or generation can make the semi-supervised learning more efficient and available for all temporal context aware methods. This approach is novel, since the type of data we have in mind as an underlying area for experiments opens new challenges concerning machine learning methods. The considered datasets do not represent long time series on one side or independent data samples without temporal context on the other side. Domain of our interest is neuropsychology. Topics of interest include: machine learning procedures over large heterogenous datasets; feedback loops between learning and expert assessment („expert-in-the-loop“ approach); novel ML methods suitable in the considered context
4 Description of ideal candidate	Graduate of computer science or cognitive psychology; knowledge of machine learning methods Commitment and a cooperative attitude; Proficiency in written and spoken English

Mentor

Lenka Lhotská	CIIRC	CogSys	lhotska@cvut.cz

Salary: CZK 70 000 per month

CTU Global Postdoc Fellowship

Research topic #12-3

1 Topic	Learning to solve multiple-view geometry
2 Link to topic / project page	aag.ciirc.cvut.cz
3 Short description of topic	We aim at using machine learning to address long-standing problems in multiple view geometry that traditional techniques cannot solve. For instance, current methods for computing camera geometry from image matches can cope efficiently with only relatively simple problems in two-view geometry, and there is still no efficient solver even for three-view geometry. We plan to develop a new approach to solving hard problems in multiple-view geometry by using machine learning to tune techniques from numerical algebraic geometry to the data, thus making them tractable and efficient.
4 Description of ideal candidate	Background in Computer Vision and Machine Learning. Interest in combining classical geometry and computational algebra with machine learning.

Mentor

Tomas Pajdla	CIIRC	Applied Algebra and Geometry	pajdla@cvut.cz

Salary: CZK 70 000 per month

CTU Global Postdoc Fellowship

Research topic #12-4

1 Topic	**Learning visuomotor skills for robotic manipulation**
2 Link to topic / project page	http://impact.ciirc.cvut.cz/
3 Short description of topic	Humans can solve everyday manipulation tasks remarkably efficiently and safely. With only a few interactions they learn to use tools without knowing a priori their exact physical properties or the properties of the environment to solve tasks such as hammering a nail, shoveling snow, raking leaves, or drilling holes into different materials. Currently, there is no artificial system with a similar level of visuomotor capabilities. The objective of this post-doc project is to develop machine learning models grounded in the physical and geometrical structure of the world to enable learning safe visuomotor skills for robotic manipulation in new unseen environments with only a minimal amount of supervision, for example, coming from observing people performing the same task.
4 Description of ideal candidate	We are looking for strongly motivated candidates with interest in computer vision, machine learning and robotics. Successful candidates will have a strong background in at least one of these fields, excellent programming skills and a proven track-record of publications at the top conferences/journals in those fields that include CVPR, ICCV, ECCV, NeurIPS, ICML, IJCV, TPAMI, JMLR, IROS, ICRA, CoRL, RSS or RAL.

Mentor

Josef Šivic	CIIRC	RMP	Josef.sivic@cvut.cz

Salary: CZK 70 000 per month

CTU Global Postdoc Fellowship

Research topic #12-5

1 Topic	Combining Neural and Symbolic Methods in Theorem Proving
2 Link to topic / project page	http://ai4reason.org
3 Short description of topic	We will combine neural and symbolic methods in theorem proving and reasoning tasks. This includes (i) targeted neural and reinforcement architectures for learning guidance of interactive and automated theorem provers, (ii) synthesizing arguments, conjectures, functions, tactics and solutions by deep reinforcement learning methods combined with theorem proving feedback, and (iii) deeper integration of symbolic and differentiable methods inside theorem provers.
4 Description of ideal candidate	Strong background in automated reasoning and machine/reinforcement learning.

Mentor

Josef Urban	CIIRC	Intelligent Systems	Josef.Urban@gmail.com

Salary: CZK 70 000 per month

CTU Global Postdoc Fellowship

Research topic #12-6

1 Topic	**Precise Visual Localization and Navigation via Implicit Neural Scene Representations**
2 Link to topic / project page	https://www.ciirc.cvut.cz/cs/teams-labs/rmp/aag/
3 Short description of topic	Visual localization and navigation algorithms are key capabilities for a wide range of applications, including autonomous robots such as self-driving cars and augmented / virtual reality systems. Typically, these algorithms rely on explicit and discrete scene representations, e.g., sparse Structure-from-Motion point clouds in the context of visual localization or voxel grids for navigation and path planning. Recently, implicit scene representations based on neural networks have been proposed that offer a continuous scene representation, with highly impressive results in terms of the accuracy of the represented 3D geometry. The objective of this post-doc project is to develop visual localization and navigation algorithms based on implicit neural scene representations. The goal is to exploit the potential of these representations, which promise highly accurate 3D scene geometry at a small memory footprint, to design highly precise localization and navigation approaches. Important scientific challenges of this project include handling changing conditions, e.g., moving furniture, and precise representations in large-scale scenes (where the camera can be 10-100 meters away from the scene).
4 Description of ideal candidate	Strong background in 3D computer vision, robotics, and / or deep learning. Publications at the top conferences/journals in those fields, e.g., CVPR, ICCV, ECCV, NeurIPS, ICML, IJCV, TPAMI, ICLR, IROS, ICRA, CoRL, RSS or RAL.

Mentor

Torsten Sattler	CIIRC	RMP	torsten.sattler@cvut.cz

Salary: CZK 70 000 per month

CTU Global Postdoc Fellowship

Applications and selection proces

To apply for the CTU Global Postdoc Fellowship you need the following documents in English:

- CV, including list of publications (max. 4 pages). At least two IF [1] journal publications are expected. Papers accepted for publication yet waiting to be prited **do count if** a proof of acceptance is provided.

- Motivation letter (max. 2 pages).
- PhD certificate (copy).
- A cover letter (See below).
- You may attach other documents supporting yor application such as recommendation letters etc.

The application must reach CTU by August 31, 2021.

Please, note that applications should be sent to Faculties/Institutes as indicated in the list of Topics/Positions.

Selection process:

Applications will be assessed by a committee, based on documents sent by applicants. The mentor has a strong vote in the selection process.

An (online) interview preferably within the first half of September will be organized.

The final decision of the committee will be comunicated to applicants by October 15, 2021.

Fellows are expected to start their job at CTU from January 2022.

1 Impact Factor. We follow the Web of Science Journal Citation Reports .

CTU Global Postdoc Fellowship

Application for CTU Global Postdoc Fellowship

(Editable version in .docx here)

1. Applicant

Name(s)	Surname	e-mail	Mailing address
Date and place of birth	Country(ies) of citizenship	Skype or similar contact(s) for interview	

2. Topic (selected from the list)

Research topic #	Topic

3. List of accompanying documents:
   a. CV including list of publications (mandatory)
   b. PhD certificate (copy) (mandatory)
   c. Recommendation letter
   d. …….

4. I apply for the CTU Global Postdoc Fellowship.

……

Date, signature