CTU Global Postdoc Fellowship

Available topics/positions

Faculty of Civil Engineering available Topics/positions

Faculty of Information Technology available Topics/positions

Czech Institute of Informatics, Robotics and Cybernetics available Topics/positions

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. The mentor has a strong vote in the selection process.

Applicants are advised to contact mentors for more details.

The deadline for submission is indicated for each research topic/position. How to apply.

Topics/positions available at the

Faculty of Civil Engineering

Research topics:

#1-4 Topology optimization of pneumatically actuated programmable metamaterials for soft robotics applications

Applications should be sent to

E-mail: zuzana.bazikova@fsv.cvut.cz

or

Faculty of Civil Engineering CVUT
Attn: Ing. Zuzana Baziková
Thákurova 2077/7
160 00 Praha 6
Czech Republic

Research topic #1-4

1 Topic	**Topology optimization of pneumatically actuated programmable metamaterials for soft robotics applications**
ERC research field descriptor	15.17 Materials engineering; 15.18 Mechanical engineering; 15.6 Civil engineering; 27.6 Computational mathematics
2 Link to topic / project page	• Faltus, O., Horák, M., Doškář, M., Rokoš, O., (2024). Third medium finite element contact formulation for pneumatically actuated systems. Computer Methods in Applied Mechanics and Engineering 431, 117262. https://doi.org/10.1016/j.cma.2024.117262 • Dalklint, A., Wallin, M., Tortorelli, D. (2024). Simultaneous shape and topology optimization of inflatable soft robots. Computer Methods in Applied Mechanics and Engineering 420, 116751. https://doi.org/10.1016/j.cma.2024.116751 • van Bree, S.E.H.M. , Rokoš, O., Peerlings, R.H.J., Doškář, M., Geers, M.G.D. (2020). A Newton solver for micromorphic computational homogenization enabling multiscale buckling analysis of pattern-transforming metamaterials. Computer Methods in Applied Mechanics and Engineering (Vol. 372, 113333). https://doi.org/10.1016/j.cma.2020.113333 • Bendsøe, M. P., Sigmund, O. (2004). *Topology optimization*. Springer Berlin Heidelberg. https://doi.org/10.1007/978-3-662-05086-6 • Liu, C. -H., Chen, L. -J., Chi, J. -C., & Wu, J. -Y. (2022). Topology Optimization Design and Experiment of a Soft Pneumatic Bending Actuator for Grasping Applications. IEEE Robotics and Automation Letters (Vol. 7, pp. 2086–2093) https://doi.org/10.1109/LRA.2022.3142910 • Caasenbrood, B., Pogromsky, A., & Nijmeijer, H. (2020). A Computational Design Framework for Pressure-driven Soft Robots through Nonlinear Topology Optimization. 3rd IEEE International Conference on Soft Robotics (RoboSoft), New Haven, CT, USA, pp. 633–638 https://doi.org/10.1109/RoboSoft48309.2020.9116010 • Tyburec, M., Doškář, M., Somr, M., Kruzik, M., Zeman, J., (2025). Modular-topology optimization for additive manufacturing of reusable mechanisms. Computers and Structures, 307, 107630. https://doi.org/10.13140/RG.2.2.29545.26724
3 Short description of topic	In this project, the candidate will develop advanced topology optimization techniques and computational tools to enable the rational design of pneumatically actuated microstructures with applications in active mechanical metamaterials and soft robotics. The primary goal is to design and implement multistable microstructures that can transition between multiple stable states through internally applied pressure and internal contact. Each (locally stable) configuration will be designed to exhibit different effective properties, which are essential in, e.g., designing a soft robotic finger following a pre-defined trajectory. An essential optimization criterion in this context is the effective stiffness or a target deformation as a function of the applied pressure, combined with local stability considerations.. To achieve these goals, the candidate will develop topology optimization tools that integrate pressure actuation, internal contact, and multistability. The work

	will begin by extending a recently proposed unified formulation for contact and pressure actuation to three dimensions. This will be followed by an in-depth study of a single periodic unit cell designed to achieve specified target properties. Later, these methods will be scaled up to finite specimens, complete end-effectors, or more complex gripper systems, including modularity considerations. Depending on the interests of the candidate and the time available, experimental validation may also be pursued. The project will be carried out in close collaboration with the [research group](#) led by Dr. [Ondřej Rokoš,](#) Assistant Professor in the Department of Mechanical Engineering at the Eindhoven University of Technology. In addition, the candidate will benefit from being embedded in the [ROBOPROX](#) project, an EU-funded multidisciplinary initiative that brings together experts in discrete and continuous optimization, robotics, computer science, and computational materials science.
4 Description of ideal candidate	Candidates should have a proven background in some or, ideally, all of the following areas: ● Modeling of elastic materials with large deformations and instabilities, ● Computational mechanics of materials and structures, ● Topology optimization and (computational) homogenization, 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 70 000 per month
Application deadline: Open call

Topics/positions available at the

Faculty of Information Technology

Research topics:

#8-2 Algorithmic and combinatorial game theory

Applications should be sent to

E-mail: lenka.frycova@fit.cvut.cz

or

Faculty of Information Technology CVUT
Attn: Mgr. Lenka Fryčová
Thákurova 2077/7
160 00 Praha 6
Czech Republic

Research topic #8-2

1 Topic	**Algorithmic and combinatorial game theory**
ERC research field descriptor	27.7 Discrete mathematics
2 Link to topic / project page	Algorithmic game theory - Wikipedia Combinatorial game theory - Wikipedia
3 Short description of topic	The first topic of the project is the algorithmic game theory, which is a modern branch of classical game theory, focusing on algorithmic aspects of modelling the behaviour of participants (players) of certain competitive process (game). The motivation is the study of methods, how to control competitive environment with many players and without a central authority which may impose demands on players. It is possible to attain this goal by designing locally defined games, whose Nash equilibria correspond to globally desirable outcomes. This fact is captured by the low price of anarchy of the game. The goal of the project is to establish and publish new results in algorithmic game theory, mainly by designing games where the Nash equilibria correspond to globally desirable outcomes and by investigating their algorithmic and computational complexity aspects. The second topic deals with the broad range of combinatorial games, mainly in the subfield of the various cops-and-robber settings. Here the setting is usually defined as a game on graph between two players controlling two sets of pawns, where the typical goal of one player is to capture the pawns of the second player. There is however great variability on the rules. Here the task is to study the computational complexity of questions like who wins or how many pawns are neede to win. The project is theoretical, with the expected outcome in the form of publications in high-ranking conferences or prestigious journals
4 Description of ideal candidate	The applicants are expected to have a strong background in combinatorics, graph theory, foundations of algorithmic game theory or combinatorial game theory. Additionally, specialization in the following areas is a bonus: graph algorithms, copsand-robber-type problems, computational complexity or approximation algorithms. The applicant must have obtained a PhD in the relevant area no later than 7 years ago.

Mentor

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

Salary: CZK 65 000 per month
Application deadline: 28. 4. 2025

Topics/positions available at the

Czech Institute of Informatics, Robotics and Cybernetics

Research topics:

#12-1   Machine learning security and resilience

#12-7   Interactive teaching of robotic skills

Applications should be sent to

E-mail: nela.soltysova@cvut.cz

or

CIIRC CVUT
Attn: Nela Šoltysová
Jugoslávských partyzánů 1580/3
160 00 Praha 6
Czech Republic

Research topic #12-1

1 Topic	**Machine learning security and resilience**
ERC research field descriptor	9.0 Computer science
2 Link to topic / project page	https://www.ciirc.cvut.cz/teams-labs/ai/ml/
3 Short description of topic	Machine learning models play an increasingly important role in decision making across many applied domains such as robotics, health, or finance. It is therefore crucially important that they are sufficiently secure and resilient to adversarial or anomalous input. In this project, we aim to develop methods that improve the security and resilience of machine learning models, with emphasis on robotics applications, so improving the robustness of robots especially in open environments.
4 Description of ideal candidate	Background in machine learning. Experience/interest in data analytics, robotics, and cybersecurity is welcome.

Mentor

Robert Babuška	CIIRC	Machine Learning	robert.babuska@cvut.cz

Salary: CZK 75 000 per month
Application deadline: Open call

Research topic #12-7

1 Topic	**Interactive teaching of robotic skills**
ERC research field descriptor	9.0 Computer science
2 Link to topic / project page	https://www.ciirc.cvut.cz/teams-labs/ai/ml/
3 Short description of topic	Physical human-robot interaction is an active but largely unsolved research area. It concerns situations where humans get in contact with robots either for collaboration or teaching. While the need for safety governs today's robot operations in the presence of humans, the concepts of sliding autonomy, (imitation) learning combined with advanced control (e.g., adaptive impedance control or model predictive control), and perception can lead to breakthrough developments regarding the effectiveness of robots and the ease of their deployment. In this project, we aim to develop novel methods that allow the robot to learn from human teachers and with human collaborators.
4 Description of ideal candidate	Background in robotics. Experience/interest in machine learning. (Proven) code development skills and experience in Unix-based systems (preferably Python or C++).

Mentor

Robert Babuška	CIIRC	Machine Learning	robert.babuska@cvut.cz

Salary: CZK 75 000 per month
Application deadline: Open call

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 three IF [1] journal publications are expected or CORE A*/A conference paper. 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).
- Application for CTU Postdoc Fellowship Program – completed and signed.
- You may attach other documents supporting yor application such as recommendation letters etc.

Each research topic/proposal has a deadline for submission.

Please note that submissions should be sent to the contact address of the faculty/institute listed in the list of topics/positions.

Selection process:

- Applications will be assessed by the committee on the basis of the documents sent by the applicants. The mentor has a casting vote in the selection procedure.
- The interview will be arranged online.
- The starting date is indicated for each research topic/position.

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