Parallel and Distributed Systems
at Masaryk University

Jiří Barnat and Luboš Brim and Ivana Černá

Masaryk University
Czech Republic
Czech Republic
Masaryk University

- Second largest university in the Czech Republic
- Founded in 1919
- 9 faculties, more than 200 departments, institutes and clinics
- 45,000 students
- Student-driven education and an ECTS system
Masaryk University – Structure

- Faculty of Law
- Faculty of Medicine
- Faculty of Science
- Faculty of Arts
- Faculty of Education
- Faculty of Economics
- **Faculty of Informatics**
- Faculty of Social Studies
- Faculty of Sports Studies
Established in 1994
The very first faculty of its kind in the Czech Republic
2,300 students at Bachelor, Master and Doctoral level
FI MU – Structure of studies

Bachelor Degree Programmes – Bc.
- 3 years
- 180 ETCS credits

Master Degree Programmes – Mgr.
- 2 years,
- 120 ETCS credits

Doctoral Degree Programme – Ph.D.
- 4 years
- 240 ETCS credits

Long-life Learning
Informatics

- Informatics
- Mathematical Computer Science
- **Parallel and Distributed Systems**
- Computer Systems and Data Processing
- Computer Networks and Communication
- Computer Graphic and Image Processing
- Embedded Systems
- Artificial Intelligence and Natural Language Processing

Applied Informatics

- Applied Informatics
- Bioinformatics
- Informatics for Public Administration

Informatics with another discipline
Parallel Distributed Systems
Bachelor Degree at Faculty of Informatics, MU
PDS Field Structure

General Computer Science – Bachelor Degree
- Compulsory courses shared among all fields
- Basics in computer science and math
- Bachelor’s Thesis
- 110 of 180 ETCS credits (60%)

Obligatory PDS courses
- Lectures, projects.
- 40 of 180 ETCS credits (22%)

Student-Driven Education
- Any curses provided by Masaryk University
- 30 of 180 ETCS credits (18%)
"Standard" topics from PDC curriculum

- Architecture and technology
- Programming skills
- Algorithmics

Specific ingredients

- Solid mathematical background
- Formal verification and validation
- Participation on research activities
Mathematical Background

**General Idea of Education @ FI**
- Studies of math is good way of brain exercising.
- Value that will survive dynamic evolution in computer science.

**Well trained brains can**
- Abstract from details while preserving the essence.
- Separate cause from consequences.
- Learn and apply new concepts easily.
- Identify known in new.
- ...
Reasoning about parallel systems

- Much more complicated than in sequential case.
- Lack of compositionality.

Correctness of a PDS is an issue

- Testing is insufficient in sequential case
- Situation is even worse for parallel systems
- Need for formal reasoning and formal verification methods
Research activities

Laboratories @ FI
- Service to exceptional students of individual working groups
- Participation in education and research activities

ParaDiSe Lab @ FI MU
- Research interest in parallel methods of formal verification.
- DiVinE – Distributed-memory tool for verification of discrete parallel systems.
Key Courses of PDS @ FI

Architecture
- Supercomputer Architectures and Intensive Computations

Programming
- Design and Implementation of Parallel Systems
- GP GPU Programming
- Project on Programming Parallel Applications

Algorithmics
- Parallel Algorithms and Models of Computation

Analysis
- Introduction to Validation and Verification

Theoretical background
- Communication and Parallelism
Conclusions

Mental Training

- Will never become obsolete.
- Achieved by strong emphasis on theory and math.
- Significantly shortens time to learn

Analysis of Parallel Systems

- Analysis and verification of PDS is much more complicated compared to sequential case.
- Formal verification techniques are a must for PDC curriculum.