Doctoral Program in Computer & Communication Sciences (EDIC)
Prof. Matthias Grossglauser
EDIC Program Director
Why a PhD?

- PhD is about where IT revolution is going, and how you can be at the center of it all!

- You should consider a PhD if you want:
  - Be an academic
  - Take leadership positions in industry R&D
  - Preparation for a startup
Who should do a PhD?

- Fascinated by IT and have an aptitude for science and engineering
- Passionate about understanding how and why things work, the underlying fundamentals
- Want the breadth and depth for a vision to have an impact and make a difference
What is a PhD?

- Choose and define an important problem
  - One that no one has solved before
  - One that makes a difference in the field

- Find an effective solution
  - Learn to read and understand prior work
  - Learn to conduct research

- Disseminate
  - Present your results in writing and orally to the community and industry
Why a PhD at EPFL?

* Computer Science & Engineering
Computer & Communication Sciences: Who we are?

• Internationally highly ranked
• 42 faculty members
• From peer schools (e.g., Berkeley, CMU, Cornell, MIT, Stanford, …)
• Internationally recognized (e.g., Turing Award, US National Academies, ACM/IEEE Fellows)
• Strong industrial liaison
• Information theory to datacenters
### IC School Startups

- Anemomind
- Artmyn
- Aubep
- B-mob
- Beijing DAAV Technologies
- BugBuster
- CodeTickler
- Crossing-Tech
- Cyberhaven
- Dartfish
- Db4all
- Digital Optim
- DomoSafety
- EDSI-Tech
- Faceshift
- Geosatis
- Global ID
- Ikaneos
- Illusonic
- iNoCs
- Innoview
- Jiillion – Jime
- JustCloudit
- Kandou Bus
- Lantern
- Solutions
- Livestream
- MadeinLocal
- Minsh
- Nextthink
- nVisio
- OZWE
- PatternLab
- Pix4D
- Playfulvision
- PocketCampus
- Prediggo
- Pryv
- Quividi
- Raw Labs
- RAYFORM
- RouteRANK
- S1 Systems
- Scala Solutions
- Sensorscope
- Shoelace
- Wireless
- Simpliqity
- SonoView
- Acoustic
- TradeYourMind
- True eBooks
- Publishing
- Typesafe
- Usefultweb
- Vidinoti
- Visualbiotech
- Wizzy
- Education Technologies
- Zebravia

### 230 EPFL startups created since 2000

CHF 397 million raised in 2016
Path to a PhD

Courses
Research
Publish
TAing
Conferences
Internships
Defense

4~6 years

4~6 years
Information & Communication Theory

Erasure* Channel’s Capacity Achieved by Reed-Muller Codes (LTHC)
A solution to a long-standing conjecture in coding theory. That is, Reed-Muller codes achieve capacity on erasure channels under optimal decoding and provide general proof for codes with sufficient symmetry.

Signal Processing

Simultaneous Localization and Mapping from Echoes (LCAV)
Researchers demonstrate that echoes provide sufficient clues to reconstruct the room’s and the array’s geometries jointly, even from a single acoustic event.
interfacing with humans ...

Graphics

Computational Design and Fabrication with Auxetic Materials (LGG)
A computational method for interactive 3D design and rationalization of surfaces via auxetic materials, i.e., flat flexible material that can stretch uniformly up to a certain extent.

Graphics & Vision / Image Processing

3D Human Pose Estimation from Videos (CVLAB)
An efficient approach to exploiting motion information from consecutive frames of a video sequence to recover the 3D pose of people.
Computer Architecture

*FPRESSO – A New Approach to Model the Delay & Area of FPGA* Architectures (LAP)*

A novel approach, called Fpresso, to model the delay and area of a wide range of largely different FPGA architectures quickly with reasonable security.

Networks and Computational Neuroscience

*Rapid Path Planning Enabled by Attractor Network Dynamics (LCN)*

Researchers show that, in networks with large place fields, the network properties cause the bump to move smoothly from its initial location to the goal, around obstacles or walls. Results illustrate that an attractor network with hippocampal like attributes may be important for rapid path planning.

Programming Languages & Formal Methods

*The Essence of Dependent Object Types (LAMP)*

Researchers demonstrate why languages like Scala have foundations, which are not directly related via the Curry-Howard isomorphism to logic. Focusing on path-dependent types, the team shows the foundations for Scala from its first principles.
Artificial Intelligence / Image Processing

*Flying Object Detection from a Single Moving Camera (CVLAB)*

Research is based on developing a novel approach to detecting flying objects such as UAVs and aircrafts when they occupy a small portion of the field of view, while possibly moving in complex backgrounds, and are filmed by a camera that itself moves.

Security & Cryptography

*Collective Signing used to Enhance Bitcoin Security and Performance (DEDIS)*

Researchers introduce ByzCoin, a novel Byzantine consensus protocol that leverages scalable collective signing to commit Bitcoin transactions irreversibly within seconds. Optimization enable ByzCoin to achieve a throughput higher than Paypal currently handles, with confirmation latencies of 15-20 seconds.
EDIC Program

In a nutshell:
- 4-6 years
- Program entirely in English
- Paid at 75% entry-level engineering salary (~51kCHF)
- One-year fellowships to outstanding applicants

In numbers:
- 250 PhD students, one of the largest program on campus
- 60 join per year, from pool of ~700
- ~5 PhD students per IC faculty (+ affiliated faculty)
EDIC – Admission Cycle

1\textsuperscript{st} admission cycle (deadline December 15\textsuperscript{th})
   - This is the main admission cycle
   - Synchronized with US/Canada
   - Apply NOW!

Smaller 2\textsuperscript{nd} admission cycle (deadline April 15\textsuperscript{th})
   - Fewer applications, fewer admissions
   - Synchronized with Europe
   - Will not get a chance to visit the EDIC Open House
EDIC – Admission Cycle

1st Admission Cycle
- Application deadline 1st cycle
- Mid Jan.
- 2-day Open House
- End March
- End April
- Acceptance deadline
- Admission decisions sent out
- Dec. 15

2nd Admission Cycle
- Application deadline 2nd cycle
- April 15
- Admission decisions sent out
- End May
- Acceptance deadline
- Mid. June
- Sept. Enrollment

- Over 700 applications – 50 from EPFL students
- Enroll roughly 60 (of which 30% from EPFL)
- Accept the top 45 ranked as “fellowship” (of which 20% from EPFL)
EDIC – Application Process

- See the EDIC webpage for specific requirements
- Go through IC faculty webpages to identify the research areas and the professors that are of most interest to you
- Write your *Statement of Purpose* (SoP). Document clearly reasons for wishing to do a doctoral thesis with EDIC, whom you would like to work with and explain longer-term professional goals.
- Find 3 referees. Ask someone who can comment on your academic performance and your potential to do solid research with specific examples. Make sure that the letters are submitted by the application deadline!
Application – Writing your SoP ...

➢ First paragraph
  – Describe the general areas of research that interest you and why

➢ Second to fourth paragraph
  – Describe some research projects that you worked on. What was the problem you were trying to solve? Why was it important? What approaches did you try? What did you learn? It’s fine to say that you were unable to fully solve your problem

➢ Fifth and sixth paragraph
  – Tell us a little bit about yourself and your life experiences. Why do you feel you need a PhD? Why is EDIC the right place for you? Whom would you like to work with?
During your PhD with EDIC

- You will have an advisor/co-advisor
  - Will be with you until you graduate
  - Courses, research, career planning
  - Official annual feedback (evaluations)

- You will have a mentor
  - An EDIC Committee contact person for the 1st year
  - An IC faculty member beyond (from outside area)
  - Someone to talk to in general
Industrial Fellowships / Internships

- Top students participate in industrial fellowships and internships
- Highly selective
- Many include internships
- Students also intern with our industrial affiliates
### Industry
- Adobe
- Apple
- Disney Zurich
- Facebook
- Google
- HP
- IBM
- Intel
- Microsoft
- Natunix
- NEC

### Industry (cont.)
- Neovision
- Nokia
- Oracle
- Orbiwise
- Qualcomm
- SAP
- Synopsis
- Swisscom
- Technicolor
- Vmware
- Yandex

### Universities
- Carnegie Mellon
- Cornell
- Harvard
- HKUST, Hong Kong
- MIT
- North Carolina
- Stanford
- UC Berkeley
- Queensland
- Surrey
- Washington

A partial list where EDIC PhD students intern …

35-40 internships on average per year
EDIC Graduates - Origin of Doctoral Students (2006-2016)

450 Theses awarded

Europe 40%:
- France 7%
- Romania 6%
- Serbia 5%
- Italy 4%
- Greece 3%

Switzerland 25%

Americas 4%

Asia & Oceania 30%:
- Iran 9%
- India 6%
- China 6%
- Turkey 5%

Africa 1%

EDIC Graduates – From where to where?

- Switzerland [25%]
- Iran [9%]
- France [7%]
- China [6%]
- Romania [6%]
- India [6%]
- Serbia [5%]
- Turkey [(5%]

Switzerland [45%]

USA [21%]

UK [4%]

Germany [3%]

France [3%]

450 Theses awarded

2006-2016
EDIC – Where do our graduates go?

- Industry: 65%
- Academia: 30%
- No data: 5%

2006-2016
450 Theses awarded
EDIC – Where do our graduates go?

Ivan Dokmanic
Assistant Professor
University of Illinois
- EPFL Doctorate Award – 2016
- Denantes Thesis Award – 2015
- Google European Doctoral Fellowship – 2014

Listening to distances and hearing shapes: Inverse problems in room acoustics and beyond [2015]
Thesis Advisor: Prof. Martin Vetterli, Audiovisual Communications Lab

Volodymyr Kuznetsov
CEO & Founder
Cyberhaven
- Cyber security startup
- His work adopted in LLVM, Chrome, Android
- 2 issued patents in the USA

Transactions Chasing Scalability and Instruction Locality on Multicores [2014]
Thesis Advisor: Prof. Anastasia Ailamaki, Data-Intensive Applications and Systems Lab

Pinar Tözun
Research Staff Member
IBM Almaden Research
- ACM Sigmod Jim Gray Doctoral Award, Honorable Mention – 2016
- Expert at SIGMOD 2016 for the Careers in Industry Panel
- Current research focuses on scalability & efficiency of data mgmt. systems

Techniques for strengthening the security and reliability of systems software using program analysis and instrumentation [2016].
Thesis Advisor: Prof. George Candea, Dependable Systems Lab

EDIC – Where do our graduates go?
In conclusion ...

- Rich intellectual environment with international focus
- Graduate students collaborate with world-renowned faculty
- Benefit from generous resources and a rich network of academic and industrial partners
- Value close interaction between students and faculty within a flat organization structure
- EDIC alumni pursue stellar international careers as academics, scientists, and entrepreneurs
Need more information ...

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