Computer Vision and Machine Learning at IST Austria

and

How to Become a Scientist (preferably in Computer Vision/Machine Learning)
at one of the most exciting times in history

Christoph Lampert
Science is Everywhere
Scientists are in High Demand
Scientific Career in Academia

Standardized career path world-wide:

- Step 1: Obtain a Bachelor’s and/or Master’s Degree
- Step 2: Obtain a Doctorate/PhD
- Step 3: Work as a “Postdoc” for a few years
- Step 4: Become an Assistant Professor
- Step 5: Become a Tenured Professor

What about science outside of academia?

• Leave the process anywhere after Step 2
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Case Study: me

- **2000**: Master's degree in Pure Mathematics
  University of Bonn, Germany
- **2003**: PhD in Pure Mathematics
  University of Bonn, Germany
- **2004-2007**: Postdoc in Computer Science
  DFKI Kaiserslautern, Germany
- **2007-2010**: Postdoc in Computer Science
  MPI Tübingen, Germany
- **2010-2015**: Assistant Professor
  IST Austria, Vienna, Austria
- **since 2015**: Professor
  IST Austria, Vienna, Austria
What's noteworthy?

• 2000: Master's degree in Pure Mathematics
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I completed all steps. √
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I completed all steps.

✔️

I switched fields after the PhD.

✔️

• Not a problem, many scientists switch fields during their careers.

⚠️

After the Master’s, I stayed at the same university for my PhD.

• Not a good idea, I should have moved.

⚠️

My Master’s, PhD and Postdoc were in the same country.

• Not a good idea, experience abroad is very important.

✔️

I was Assistant Professor and Professor at the same place.

• “tenure-track” position
Scientific Career

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Outside of academia:
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Beware: competition is fierce!
Careers of Scientists after the PhD

How to have the best chances?
How to have the best chances?

- Study at a good university.
How to have the best chances?

• Study at a good university.
How to have the best chances?

• Study at a good university.

• Do your PhD at an even better institution:
How to have the best chances?

• Study at a good university.

• Do your PhD at an even better institution:
  – change the university, ideally go abroad
  – apply to several PhD programs, but not too many: you must be able to tailor your application
    • often: some top choices, one or two “fallback” options
  – select programs that fit your interests, but don't be narrow-minded regarding topics
  – start early: up to one year between application deadline and start of the program!
Behind the scenes...

ISTScholar
The PhD Program at IST Austria
Research Institute
- PhD-granting graduate school
- no undergraduate studies

- opened in 2009
- located close to Vienna

- focus on
  - curiosity-driven basic research
  - interdisciplinarity

- fully English-speaking
Five Interacting Research Clusters

Currently 41 research groups, faculty members from 19 different countries: Austria, Bulgaria, Czech Republic, Denmark, Germany, Greece, Hungary, India, Italy, Japan, Netherlands, Poland, Portugal, United Kingdom, USA, Romania, Russia, Slovenia, Switzerland
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Austria, Bulgaria, Czech Republic, Denmark, Germany, Greece, Hungary, India, Italy, Japan, Netherlands, Poland, Portugal, United Kingdom, USA, Romania, Russia, Slovenia, Switzerland
**ISTScholar PhD program**

- US-style graduate school
  - Centralized admissions process
  - Initial ‘unaffiliated’ phase with courses and rotation projects
  - Enter with a bachelor’s or master’s degree
ISTScholar PhD program

Phase I
- Basic Courses
- General Core Course (6 ECTS credits)
- Track Core Course (6 ECTS credits)
- Elective Courses (12–24 ECTS credits)
  - Rotation 1
  - Rotation 2
  - Rotation 3
  - Rotation 4
  - Rotation 5

Affiliation with Research Group
Qualifying Exam

Phase II
- PhD Thesis Research
- Teaching (as TA)
- Progress Reviews (every 6 months)
- Third-year Research Presentation

Thesis Defense

PhD Degree
ISTScholar PhD program

• one interdisciplinary PhD program
  – Curriculum promotes depth and breadth

• specialized tracks in
  – Physics,
  – Mathematics,
  – Computer science,
  – Data science and scientific computing
  – Biology,
  – Neuroscience.
## Tracks and segments

<table>
<thead>
<tr>
<th>Physics</th>
<th>Mathematics</th>
<th>Computer Science</th>
<th>Data Science and Scientific Computing</th>
<th>Biology</th>
<th>Neuroscience</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Physics Core</strong></td>
<td><strong>Mathematics Core</strong></td>
<td><strong>Computer Science Core</strong></td>
<td><strong>DSSC Core</strong></td>
<td><strong>Biology Core</strong></td>
<td><strong>Neuroscience Core</strong></td>
</tr>
<tr>
<td>Continuum Mechanics and Hydrodynamics</td>
<td>Discrete Math</td>
<td>Programming Languages</td>
<td>Quantitative and Computational Methods in Biology</td>
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<tr>
<td>Atomic, Molecular and Optical Physics</td>
<td>Probability</td>
<td>Artificial Intelligence</td>
<td>Probalistic Models</td>
<td>Systems Biology</td>
<td>Translational Neuroscience</td>
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<tr>
<td>Mathematical Physics</td>
<td>Algebra</td>
<td>Visual Computing</td>
<td>Data Analysis</td>
<td>Cell and Developmental Biology</td>
<td>Developmental Neuroscience</td>
</tr>
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<td>Biophysics</td>
<td>Analysis</td>
<td>Software Systems</td>
<td>Optimization</td>
<td>Molecular and Structural Biology</td>
<td>Molecular and Cellular Neuroscience</td>
</tr>
</tbody>
</table>
**ISTScholar PhD program**

- Close mentorship by faculty
  - Small research groups
  - Advice from mentor, supervisor, and thesis committee (internal and external)

- Strong feeling of coherence between students
  - Building life-long connections
  - Truly international: currently ~140 students from ~40 countries
**ISTScholar PhD program**

Benefits for PhD students:

- competitive salary (full position) with all social security benefits
- independent travel budget for each student
- subsidized housing options on campus
- campus life:
  - soccer field, tennis courts, volleyball court, in-house gym, bar, kindergarten, ...
Vienna!

voted “most livable city worldwide” for six years in a row*

famous for almost everything good in life: Culture, History, Entertainment, Food & Drinks, ...and Science!

* Mercer's Quality of Living Rankings, 2010-2016
**ISTScholar PhD program**

- Is it hard to get in? Absolutely...

- In 2015/16: acceptance rate ~2%
  - over 4000 applicants in online system
  - 2262 submitted applications
  - 108 on-campus interviews
  - 46 offers
  - 32 accepted
**ISTScholar PhD program**

Requirements: Bachelor's or Master's degree (by the time the program starts)

Application material:

1) **resume**
2) **transcripts** of your BS and/or MS degree
3) **statement of purpose**
4) contact details of **three referees**
   - Reference letters will be uploaded by the referees, not by you
5) optionally: English language certificates
ISTScholar PhD program

How to maximize your chances

• Prepare:
  – check out the website
    (note: for ISTScholar a new one will go online soon)
  – identify potential supervisors, ideally more than one

• Try to stand out from the crowd:
  – talk to potential supervisors at workshops/meetings
    • you can try email, but often that’s too anonymous
  – consider doing an internship before applying:
    http://ist.ac.at/research/internships/
ISTScholar PhD program

Resume

• tabular academic resume:
  – usually 1—2 pages
  – English language
  – inverse chronological order
  – no (truly) personal data required:
    • photo, marital status, religion, hobbies, ...
  – emphasize education over work experience
  – include relevant experiences/achievements:
    • awards, language skills, internships, ...
ISTScholar PhD program

Resume
**IST Scholar PhD program**

**Transcripts**

- transcripts of Bachelor and Master degree (if available)
  - courses taken
  - grades
  - if not in English: provide translation!
    - some places ask for certified translations, IST Austria does not

Note: Master’s/Bachelor’s grades **do** matter! PhD grades don’t.
**ISTScholar PhD program**

**“Statement of Purpose”**

- between 1 and 2 pages:
  - why do you want to do a PhD?
  - why at this institution?
  - what research are you interested in?
  - also: opportunity to explain things that might be awkward in the other documents
  - bad grades, gaps in the CV, ...
- be honest, but don't be modest
ISTScholar PhD program

“Statement of Purpose”

The text in the image is a statement of purpose by a student named Panfeng Wang. The student discusses their background, their interest in computer-aided drug design and discovery, and their future goals of pursuing a PhD in the field. They mention their previous experiences, such as completing a master's degree in electronic engineering and a bachelor's degree in physics. They express their interest in continuing their research in their undergraduate field, specifically in image processing and nanotechnology. They conclude by saying they are looking forward to getting feedback as a potential candidate.
ISTScholar PhD program

“Statement of Purpose”

much too long (complete PhD topic proposal)
ISTScholar PhD program

Referees

(reference letters are surprisingly important, choose well)

Note: most good places will contact referees directly for letters. If you attach any letters yourself, they will be ignored.

• most important: reference letters must be positive and strong
  – not “She's an okay student.”
  – rather “She's the smartest student I ever met.”

• also important: reference letters must be personal
  – not “I don't really know him well.”
  – rather “I supervised his master thesis.”


**ISTScholar PhD program**

**Referees**

*(reference letters are surprisingly important, choose well)*

- also important: **referees should know you scientifically**
  - not “I'm her soccer coach.” or “I'm his brother.”
  - rather “She did an internship with me for six months.”

- also: **choose a diverse set of referees**
  - not three course teachers from the same university where you study
  - ideally: different countries, or at least different institutions

- also: **scientific reputation of referees matters** as well
  - not: graduate student or first year postdoc
  - preferable: internationally well-known professor at top university

Look for potential referees already before you need them!
**ISTScholar PhD program**

*Start early*

- Application opens: October 2016
- Deadline to apply and submit: January 2017
- Interviews (selected candidates): March 2017
- Admissions offers: April 2017
- Program starts: September 2017
  - earlier start possible, e.g. internships

http://ist.ac.at/graduate-school/applications/