Research-driven education

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Software Engineering and Architecture Group

http://www.cs.rug.nl/search/
1. Software Architect

Top 100 rank: 1
Sector: Information Technology

What they do: Like architects who design buildings, they create the blueprints for software engineers to follow -- and pitch in with programming too. Plus, architects are often called on to work with customers and product managers, and they serve as a link between a company's tech and business staffs.

What's to like: The job is creatively challenging, and engineers with good people skills are liberated from their screens. Salaries are generally higher than for programmers, and a typical day has more variety.

"Some days I'll focus on product strategy, and other days I'll be coding down in the guts of the system," says David Chaiken, 46, of Yahoo in Sunnyvale, Calif., whose current projects include helping the web giant customize content for its 600 million users. Even though programming jobs are moving overseas, the face-to-face aspect of this position helps cement local demand.

What's not to like: You are often outside the management chain of command, making it hard to get things done.

Requirements: Bachelor's degree, and either a master's or considerable work experience to demonstrate your ability to design software and work collaboratively.
Outline

› **Hanze 2 RUG**
› SWE and SWA on the academic level
› Employment for SWE Masters
› Software visualization
MSc Computer Science

Variants

1. Software Engineering and Distributed Systems (SEDS)
2. Intelligent Systems (IS)
3. Computational Science and Visualisation (CSV)

HBO-bachelordiploma (Technische) Informatica students can follow 2 paths

- Kennismakingsthema’s (during HBO)
- Schakelprogramma (after HBO graduation)
Admission paths

› Kennismakingsthema’s
  • Embedded in the HBO educational programme
  • 2 thema’s of 3 courses each (3 x 5 EC).

› Schakelprogramma
  • For students that graduated from HBO but have not followed kennismakingsthema’s
  • Same courses as the kennismakingsthema’s.
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<th>Course (semester 1)</th>
<th>Alternative (semester 2)</th>
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<td>Discrete Structures [1.3]</td>
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<td>Computer Graphics [3.3]</td>
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A combination of both ways is possible e.g.

- 1 kennismakingsthema of 3 courses during HBO
- Short schakelprogramma of 3 courses at the start of your university education
An overview of all courses, description, literature, teachers etc.

www.rug.nl/ocasys

• Klik ‘zoek opleidingen’
• Vul in: ‘Computing Science’ en klik op ‘zoek’
• Klik ‘Bsc Informatica’ of ‘Msc Computing Science’
› KMT
  • Jan Baljé [j.w.balje@pl.hanze.nl]

› Schakelprogramma and any other MSc information
  • The study advisor Hanneke Niessink
  • [j.h.niessink@rug.nl]
  • 050 – 363 7132
  • [www.rug.nl/informatica]
    • Klik “onderwijs”
    • Klik “studieadviseur”
Outline

› Hanze 2 RUG
› **SWE and SWA on the academic level**
› Employment for SWE Masters
› Software visualization
Hasn’t everything been already invented in Software Engineering?

Tremendous challenges
Research is thriving
Boehm’s 21st Century Challenges

› Rapid change: avoid THWADI
  • That’s how we’ve always done it
› Uncertainty and Emergence: Consider BITAR, IKIWISI
  • Buying information to abate risk
  • I’ll know it when I see it
› Dependability: Consider DAVAS
  • Dependability as value added for stakeholders
› Diversity: Avoid OSUFA
  • One size uniformly fits all
› Interdependency: Consider TANIA
  • There are no islands anymore
Challenges in SWE

› Remember
   • There are no silver bullets in SWE
   • ...and very few lead ones too
› If you want to be a successful software engineer
   • Learning how to learn
   • Reflection instead of blind execution
   • Perform and apply research
› Academic education strives towards this mindset
   • Research-based education
Anatomy of the SEDS MSc

Courses
- Software Engineering and Architecture
- Distributed Systems and Web
- Intelligent Systems, Graphics, Inf. Systems etc.

A research internship
- Not just apply research but also perform it

A final project
- In a research group or in the industry
- A real research problem
Curriculum for SEDS

› SW Architecture
› SW Patterns
› Advanced SW Architecture
› SW Evolution
› Mobile Software
› Advanced Web Technologies
› Distributed Systems
› Ubiquitous Computing
› Student colloquium
› Image Processing

Electives
› Machine learning
› Scientific Visualization
› Business Intelligence
› E-Venturing
› System Engineering
Patterns

Organizational Business
Process Patterns (XP, SCRUM)

Requirements
Problem Frames
Analysis Patterns

Security
HCI
Middleware
Enterprise
Embedded
Product Lines

Design Patterns
Architectural Patterns
System

Design
Architecture
Research in the Patterns course

Methods
› Pattern-based architecture design
› Pattern-based architecture evaluation
› Finding patterns in Open Source systems

Toolkit
› Relations between patterns
› Pattern modeling elements
  • Architecture patterns
  • Variability
Collaboration with industry

Student Projects

- Internships
- MSc thesis
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The Software Century is here

- World communities becoming more tightly coupled
  - Need ways to collaboratively deal with rapid change
- Software provides enablers for analysis, communications, and decision support
  - Golden Age if done well
  - New Dark Ages if done poorly
- Requires many more experts
- Including cross-discipline capabilities
- Tremendously rewarding and challenging careers
  - Right in the middle of the action
University/HBO BSc usually hired as
• Software Developer/Tester
• System & Application administrator

MSc can lead to
• System/IT/SW/Solution Architect
• Consultant
• Auditor/Evaluator
• Knowledge manager
• (Education) Project Manager
• Researcher
• R&D Engineer
Thank you for your attention

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