Research and Teaching

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Neat Software Designs

2020-01-24

General outline:

- Introduction
- Research Interests
- Teaching Preferences
- Teaching Approach
- Questions

Introduction

Research and
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Introduction

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Introduction: Overview

20 **years** of work experience:

- Research: 9 years
- Teaching: 5 years
- Engineering: 9 years

International (teaching) experience:

- Russia Federation
- The Netherlands
- Germany

Introduction: Experiences

- **Teaching:**
  - Mathematics
  - Formal methods
  - Programming languages
  - Data bases
  - Software development
- **Research:**
  - Formal verification
  - Model checking
  - Control systems
  - Machine translation
- **Engineering:**
  - User requirements
  - Specification and docs.
  - Design and Architecture
  - Testing and development
  - Product ownership

Introduction: Prog. Languages

Experience in **years**:

- C++ (8)
- Java (7)
- UML (6)
- C (5)
- C# (2)
- SQL (2)
- JavaScript (1)
- Bash (10)
- MATLAB (4)
- Mathematica (1)
- Python (1)
- R (1)
- HTML (2)
- CSS (1)
- OQL (1)

Research Interests

Research Interests: Earlier

Static program analysis: (BSc, MSc)

- Information stream quality
- Hoare-based verification of C

Model Checking Markov Chains: (PhD)

- PCTL, CSL, PRCTL, CSRL
- Numerical and statistical
- Steady-state detection

Statistical Machine translation: (PostDoc)

- Distributed Machine Translation Infra.

Cyber physical systems: (PostDocs)

- Computable LTL, CTL, CTL* model checking
- Symbolic regression for BDD controllers

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Research Interests: Recent

Deep learning for control (PostDoc, 1 BSc, 3 MSc)

- Neural Networks as Correct-By-Design Controllers:
    - Performance
    - Representations
    - Verifiability
- Compact control law representations:
    - Data science models?

Model driven engineering (Product Owner, 1 MSc)

- Runtime guarantees by verifying OCL constrains on DMs.

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Research Interests: Future

Artificial Intelligence:

- True artificial intelligence
  - Self-motivated
  - Unsupervised learning
- Model checking
  - Design, training, robustness?
- Static program analysis
  - –//–

Domain specific languages:

- Evolution of DSL meta models
  - Backwards compatibility
- Designs for DSL implementations
  - Extendible and maintainable
- Runtime guarantees via static constrains

Teaching Preferences

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Teaching Preferences: Earlier

Novosibirsk State University (lecturer): (2000–2004)

- Introduction to UML
- Unified Modeling Language UML
- Introduction to C# language

TU Twente (teaching assistant): (2004–2006)

- Formal Methods for Software Engineering

RWTH Aachen (teaching assistant): (2006–2008)

- Advanced Model Checking

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Teaching Preferences: Recent

Fontys Hogeschool (docent) (2014–2015)

- <u>Discrete Mathematics</u>:
    - Linear Algebra
    - Regular Languages
    - Grammars and Finite State Automata's
    - Set theory and propositional logic
- <u>Software Engineering</u>:
    - C# ASPX .NET
    - Java Enterprise
    - Database Optimizations
    - Operating systems
    - Quality, Testing, and V-Model
    - SQL and Data modeling for RD

Teaching Approach

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Teaching Approach: Classification

Figure 1: Teaching Approaches

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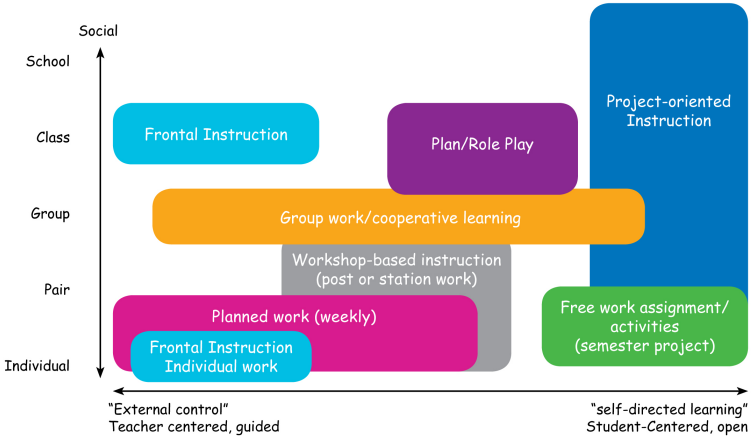Research
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Teaching Approach: Literature

An extensive study is presented **in literature**[1]:

- The ideas should follow logically
- The structure of ideas should be created in class
- Create a comfortable environment
- Use theories like: Social Learning, Constructivism, etc

Learning can differ greatly from person to person:

- 5 different teaching paradigms
- 32 different teaching models between them.

*"The best and maybe the only possible outcome is to try to
determine what methods or combination of methods a teacher
should apply to **suit the biggest percentage in a class**."*

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[1]"Choosing learning methods suitable for teaching and learning in
computer science", Estelle Taylore et al., IADIS, 2013

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Teaching Approach: Me^2

Connect:

- Be personal
- Use Humor
- Be assertive

Motivate:

- Create interest
- Challenge
- Track engagement

Guide:

- Define Structure
- Help if needed
- Keep challenging

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[2]Started on doing BKO at Fontys.

Questions

Questions

Teaching:

- What does 80% of teaching include?
- What choices for teaching are there?
- Who creates the lecture materials?
- Teaching/preparation hours per week?

Research:

- What does 20% of research include?
- What are the research topic bounds?
- Participation in projects/conferences?
- Supervising BSc. and MSc. students?

General:

- Is BKO required and time is given?
- What is to be done during vacations?