Research and Teaching

Dr. Ivan S. Zapreev

Neat Software Designs

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General outline:

- Introduction
- Research interests
- Teaching
- Questions

Introduction

Research and
Teaching

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Introduction

Research
interests

Teaching

Introduction

20 years work experience:

- 9 years – Research
- 5 years – Teaching
- 9 years – Engineering

Introduction

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

Introduction

Experience with languages:

- C/C++
- UML
- C#
- Java
- SQL
- JavaScript
- Bash
- MATLAB
- Mathematica
- Python
- R

Research interests

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Introduction

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Research interests: Earlier

Static program analysis:

- Information stream quality
- Hoare-based verification of C

Model Checking Markov Chains:

- Statistical model checking CTL
- Steady-state detection

Statistical Machine translation:

- Distributed Machine Translation Infr.

Cyber physical systems:

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

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Research interests: Recent

Deep learning for control:

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

Model driven engineering:

- 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

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Teaching preferences: Earlier

Novosibirsk State University:

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

TU Twente (assistant):

- Formal Methods for Software Engineering

RWTH Aachen (assistant):

- Advanced Model Checking

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Teaching preferences: Recent

Discrete Mathematics:

- Linear Algebra
- Regular Languages
- Grammars and Finite State Automata's
- Set theory and propositional logic

Software engineering:

- C# ASPX .NET
- Java Enterprise
- Database Optimizations
- Operating systems
- Quality, Testing, and V-Model
- SQL and Data modeling for RD

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Teaching approach

The common basics:

- Motivate
- Guide
- Challenge
- Mentor
- Use Humor

BKO is yet to be done.

Questions