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Course Organisation

Foundations of Software Engineering

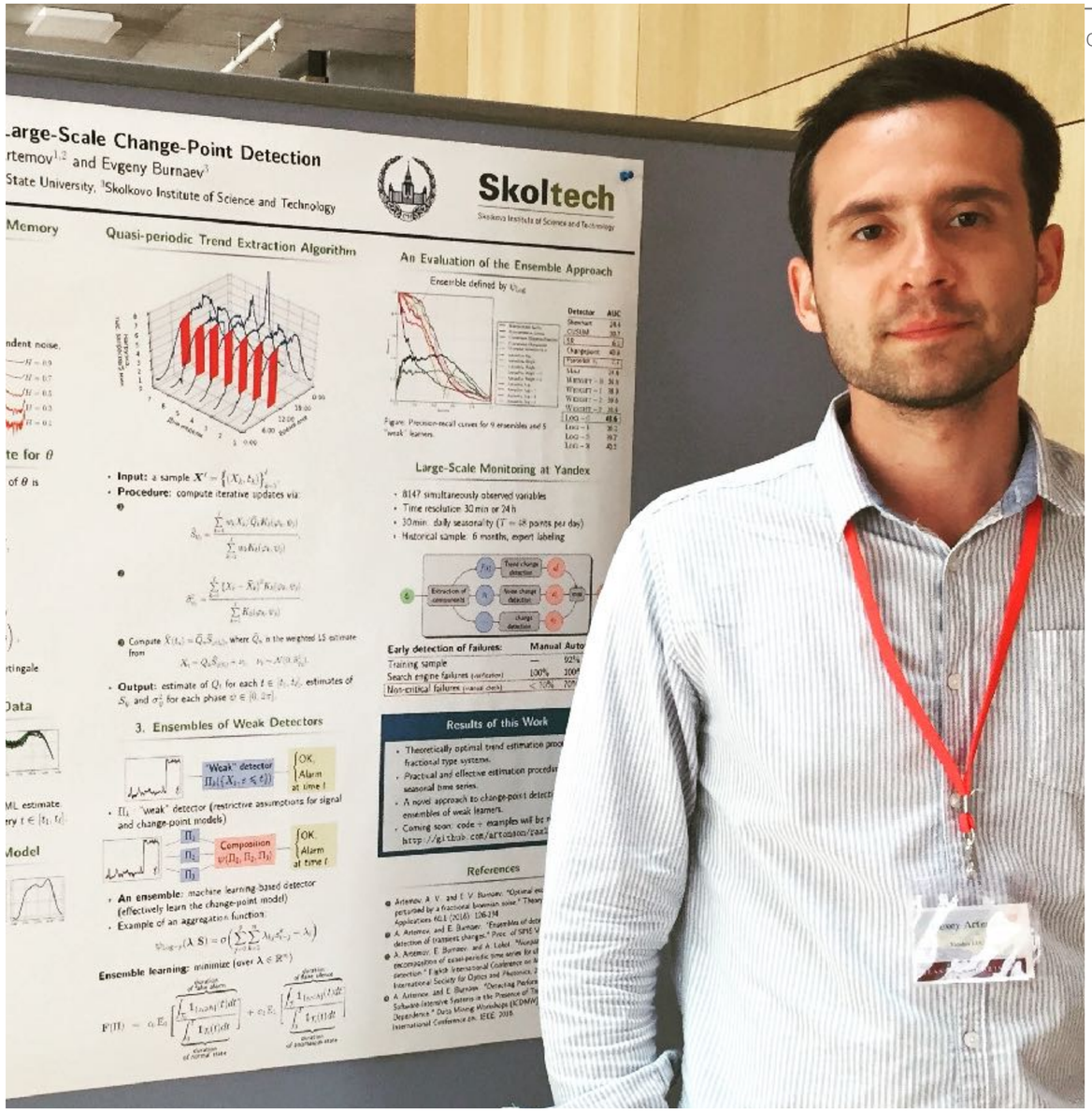
FSE v2021.1

Alexey Artemov, Fall 2021

Your instructor

Alexey Artemov, Ph.D.

- 2002—2006 LIT 1533, *Software Engineering*
- 2006—2012 Lomonosov MSU, *Physics*
- 2010—2012 Yandex Data School, *Data Science*
- 2011—2017 Yandex, Yandex Data Factory, Yandex Self-Driving, *Computer vision*
- 2012—2017 IITP RAS, Ph.D., *Statistics/Data Science/Software*
- 2017—now Skoltech, *Computer vision*
- **Core:** software, statistics and data science, computer vision
- **At Skoltech:** leading a team of 8 Ph.D., 12 MSc. students, >15 papers (5 Core A*)



Your TAs

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Emil Bogomolov

Slava Yarkin

Arseniy Bozhenko

Katya Voloshina

Outline

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§1. Organisation [15 min]

1.1. Why learn software engineering at a Data Science program?

1.2. Course outline

1.3. Course assessment

1.4. Disclaimers

§2. Course project [5 min]

2.1. Why course project?

2.2. Accomplishing the course project.

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Why learn software engineering at a Data Science program?

AI/ML/DS: 2% math, 98% coding stuff

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1.1. Why learn software engineering at a Data Science program?

- Most research in CDISE: **programming** (95% of all research in my team)
- Most experiments in CDISE: **computational experiments**
- Most projects in today's ML: **team efforts on software development**
- Most projects in today's computational sciences involve **HPC and heterogeneous computing, complex numerical libraries**
- Most cited papers in ML: **papers with great code**

It's All About The Software

Course outline

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1.2. Course outline

Goals of this course:

- Provide an introduction into the **ideas** behind software engineering
  - Build automation, version control, scripting, continuous integration, …
- Learn the **tools** commonly used in software engineering
  - Unix, git, docker, vim, make, UML, …
- Gain the **skills** needed to continue progressing with software development
  - Writing unit tests, building docker images, …

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1.2. Course outline

- Course structure for v2021.1: two “blocks”
  - Block 1: Unix fundamentals: Unix local & remote machines, scripting (3 classes)
  - Block 2: Software development in teams: version control, build automation, deployment/dockers, testing, debugging, deployment (6 classes)

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1.2. Course outline

Unix stuff | Dev in teams | Project

	Term 1B Week 1	Term 1B Week 2	Term 1B Week 3	Term 1B Week 4	Term 1B Week 8
Tuesday	*(Term 1A)*	Version control	Dependencies, reproducibility, and docker	Deploying software	Project
Thursday	Unix fundamentals: local machine 1	Unix fundamentals: remote machine	Testing software	Project	*(Term 2)*
Friday Lecture	Unix fundamentals: local machine 2	Building software	Debugging software	Project	*(Term 2)*

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1.2. Course outline

Structure of typical module (=offline class):

- Demo / lecture [50+25 min, 10 min break]
- Team-based practical/lab [25+50 min, 10 min break] → submit for assessment

Online:

- Read supplementary / watch recordings [30—60 min]
- Offline quiz [should take 15 min, 72 hours] → submit for assessment
- Work on project [should take 60–180 min] → final project

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1.2. Course outline

- 🛠️ Notion course page
- ⭕ Github Repository
- ✈️ Telegram Channel
- ✅ Anonymous feedback form

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1.3. Course assessment

- The goal of this course is to quickly raise your awareness of baseline techniques and improve knowledge, not evaluate you
- But Education asks us to still somehow do this…

The final grade =
- 40% × Computer labs
- 40% × Final project
- 20% × Test/quiz

Disclaimers

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1.4. Disclaimers

Do take this course if (either applies):

- You have (almost) never used Unix or developed industrial software (e.g. for a living)
- You are expected to work a lot with Unix environments and want to optimize your time by learning how to do things (more) efficiently

Do not take this course if:

- You have a lot of prior experience with Unix and wanna refresh / go advanced

- Our poll (canvas link, google form link) may help you decide

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1.4. Disclaimers

What you **will not** learn:

- Programming per se; Algorithms (except for a tiny subset); Project Management; Machine Learning / Big Data (no SWE for model deployment)

Ethics:

- There are multiple better ways to do things
- Unix and SWE is infinite (which is cool!) — your instructors are only aware of particular functionality
- Sharing hacks & ideas and contributing improvements is very much welcome!

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1.4. Disclaimers

- SWE is like driving a car or working out: the more you practice, the better you get at it
- Lots of exercises in this course are going to be dumb as hell: this is intentional to make you repeat things many many times

§2. Course project

Why course project?

§2. Course project

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2.1 Why course project?

- Additional educational format used in this course
- Learning by doing
- Putting yourself in real-world[-like] circumstances
- **Trying to do something useful**

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2.1 Why course project?

- **Goal: use SWE to improve real-world machine learning code repositories**
  - IN: crappy repo (not reproducible, outdated, hard to build, untested, undocumented)
  - Example: https://github.com/charlesq34/pointnet2
  - OUT: cool repo (environment/docker, automatically buildable, tests, documentation, wrapper scripts, etc.)
  - Example: https://github.com/NVIDIA/MinkowskiEngine
- Project performed in teams of size 2~4
- Each team refactors a single repo
- Results assessed by course instructors

Accomplishing the course project

§2. Course project

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2.2. Accomplishing the course project

- The goal: NOT to make the **right project**, but to make the **project right**
- Things your instructors and TAs are going to do for you:
  - Provide a set of repos to refactor
  - If needed, provide a server to run experiments
  - Provide continuous feedback

- Things your instructors and TAs are NOT going to do for you:
  - Write code, perform tests, write documentation, or negotiate with code maintainers

Quick questions?