Alexey Tregubov, Ph.D.

Computer Scientist, Machine Learning Engineer
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Work Experience

Computer Scientist | ML engineer **Information Sciences Institute USC, Los Angeles** **01/2018 – present**

- Developed synthetic data augmentation techniques for ML training using LLMs (LLama 7b, GPT-4). Improved classification precision (see selected publications).
- Developed a Double oracle optimization framework (game theory, MIP, Gurobi) augmented with agent-based simulation and GANs (DCGANs), which speeded up runtime performance by a factor of 11 (vs. average runtime without optimization).
- Developed a distributed large-scale (10M agents) agent-based simulation framework FARM/DASH, which won the SocialSim challenge.
- Designed and implemented ML models of human behavior on social networks (X/Twitter, YouTube, Reddit and GitHub) for a high-impact program on social network simulations and forecasting information spread online (regression models, XGBoost, time series forecasting, ARIMA, LSTM).
- Set up model deployment infrastructure and simulation test beds. Led a team of 4 research engineers.

Lead Software Engineer **MSS-Holding Inc., Novosibirsk** **06/2009 – 06/2012**

Systems for city's energy efficiency monitoring and control

- Designed and developed a database for master data management (Oracle).
- Managed and led a team of 5 software developers (project's chief engineer) – Spring 2011-Summer 2012.

System for operative monitoring of technological infrastructure for oil and gas fields

- Designed algorithms for energy demand prediction based on consumption of power in transportation hubs.
- Designed and developed Java backend for Data Access Layer replacing Hibernate with custom ORM for performance improvement.

Technical Skills

- Programming Languages: Python (expert, 8+ years of experience), Java (expert, 10+ years of experience), C/C++, SQL
- ML Frameworks & Libraries: TensorFlow, PyTorch, Scikit-learn, XGBoost, Keras, Gurobi, Llama 2, Code Llama
- Cloud Platforms: AWS, Docker, Kubernetes
- Data Preprocessing & Engineering: feature engineering, data cleaning and augmentation, pipeline design
- Model Development & Evaluation: model selection, hyperparameter tuning, cross-validation, metrics analysis, interpretability techniques, large-scale data processing and model training using distributed frameworks

Leadership

- Full-time project chief engineer (team leader, requirement engineer), 2011-2012
- Lead and collaborated with both fully remote and on-site teams.
- Mentored junior engineers and researchers via DataFirst program at USC, 2023-present

Education

Los Angeles, CA **University of Southern California** **2012 – 2017**

- Ph.D. in Computer Science, Software Engineering. GPA: 4.0/4.0
  Research field: Quantitative methods of SW project effort and schedule estimation (adviser Dr. B.Boehm)

Novosibirsk, Russia **Novosibirsk State University** **2005 – 2011**

- M.S. in Computer Science, 2011. GPA: 4.96/5.0
- B.S. in Computer Science, 2009. GPA: 4.96/5.0

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Selected Publications

1. **Modeling cognitive workload in open-source communities via simulation. Tregubov, A.**; Abramson, J.; Hauser, C.; Hussain, A.; and Blythe, J. In AAMAS International Workshop on Multi-Agent-Based Simulation, 2023.

2. **Dynamic graph reduction optimization technique for interdiction games.** Blythe, J.; and **Tregubov, A.** In AAMAS Workshop on Optimization and Learning in Multiagent Systems, 2022.

3. **Large-scale agent-based simulations of online social networks.** Murić, G.; **Tregubov, A.**; Blythe, J.; Abeliuk, A.; Choudhary, D.; Lerman, K.; and Ferrara, E. Autonomous Agents and Multi-Agent Systems, 36(2): 38. 2022. *Top conference: Google Scholar H5-index: 25, acceptance rate 24%*

4. **Optimization of Large-scale Agent-based Simulations through Automated Abstraction and Simplification**, **Tregubov A.**, Blythe J., In Proceedings of International Conference on Autonomous Agents and Multi-Agent Systems, May 2020. *Top conference: Google Scholar H5-index: 25, acceptance rate 24%*

5. **The DARPA SocialSim Challenge: Cross-platform Multi-Agent Simulations**, Muric G., **Tregubov A.**, Blythe J., Ferrara E., In Proceedings of International Conference on Autonomous Agents and Multi-Agent Systems, May 2020. *Top conference: Google Scholar H5-index: 25, acceptance rate 24%*

6. **The DARPA SocialSim Challenge: Massive Multi-Agent Simulations of the Github Ecosystem**, Blythe J., Ferrara E., Lerman K., **Tregubov A.**, Muric G., In Proceedings of International Conference on Autonomous Agents and Multi-Agent Systems, 13th-17th of May 2019. *Top conference: Google Scholar H5-index: 25, acceptance rate 25%*

7. **Massive Multi-Agent Data-Driven Simulations of the GitHub Ecosystem**, Blythe J., Ferrara E., Lerman K., **Tregubov A.**, Muric G., In Proceedings of International Conference on Practical Applications of Agents and Multi-Agent Systems, 26th-28th June, 2019.

8. **FARM: Architecture for Distributed Agent-based Social Simulations**, Blythe J., **Tregubov A.**, In Proceedings of International Workshop on Massively Multi-Agent Systems, July 14th, 2018.

9. **Impact of Task Switching and Work Interruptions on Software Development Processes**, **Tregubov A.**, Boehm B., Rodchenko N., Lane, J.A.; In Proceedings of International Conference on Software and Systems Process (ICSSP'17), Paris, France, 5-7 July, 2017. *Top conference: Google Scholar H5-index: 15, acceptance rate 21.9%*

10. **Evaluation of cross-project multitasking in software projects, Tregubov A.**, Lane, J.A., Boehm B.; Conference on Systems Engineering Research (CSER'17), Los Angeles, CA, 23-25 March, 2017.

11. **What does it mean to be Lean in SoSE environment? Tregubov A.**, Lane, J.A.; 26th Annual INCOSE International Symposium (IS'16) Edinburgh, Scotland, UK, July 18-21, 2016.

12. **Simulation of Kanban-based scheduling for systems of systems: initial results, Tregubov A.**, Lane, J.A.; Conference on Systems Engineering Research (CSER'15), Hoboken, NJ, 17-19 March, 2015.