

Ivan Sysoev

Postdoctoral Associate

isysoev@mit.edu | +1-404-789-5346

550 Memorial Dr., Cambridge, MA, 02139, room 18D-1

PROFESSIONAL INTERESTS

- Child-driven learning
- AI-driven scaffolding
- Technologies for supporting play and self-expression

EDUCATION

Massachusetts Institute of Technology

Cambridge, MA

PhD in Media Arts and Sciences, GPA: 5.0 / 5

2014 – 2020

Dissertation title:

Digital Expressive Media for Supporting Early Literacy through Child-Driven, Scaffolded Play

Advisor: Deb Roy

Georgia Institute of Technology

Atlanta, GA

Master of Science in Computer Science, GPA: 4.0 / 4

2012 – 2014

Master's project: *Viewpoints AI* (co-creative art installation)

Advisor: Brian Magerko

Novosibirsk State University

Novosibirsk, Russia

Master of Science in Computer Science, GPA: 4.86 / 5

2009 – 2011

Thesis title: *Applying a Variational Constraint Solver to 3D Geometry Editing*

Advisor: Dmitry Ushakov

Novosibirsk State University

Novosibirsk, Russia

Bachelor of Science in Computer Science, GPA: 5.0 / 5

2005 – 2009

Thesis title: *Applying Lazy Evaluation to Semantic Text Analysis*

Advisor: Elena Sidorova

RESEARCH EXPERIENCE

MIT Media Lab

Cambridge, MA

Postdoctoral Associate, Personal Robots Group

2020-present

- Developing robotic companions to support development of early literacy and creativity in children in a playful, engaging and empowering manner.

Cambridge, MA

Research Assistant, Social Machines Group

2014 – 2020

- Explored the paradigm of child-driven, machine-guided learning in the domain of early literacy. To that end, designed and implemented *SpeechBlocks*, an expressive mobile-based medium for learning, and evaluated it via studies with children.
- Utilized iterative design methodology by conducting about twenty play-testing sessions.
- Developed a scaffolding routine that guides children through building words of their own choice.
- Implemented various input mechanisms for the routine, such as recognizing the child's

speech, navigating network of semantic associations between words, and interpreting the child's invented spelling utilizing a modified version of Wagner-Fischer algorithm.

- Developed a novel information-theoretic approach to align pronunciation and spelling of words.
- Designed and partially animated a set of 71 onomatopoeic mnemonics in order to see whether phonemes might serve as a better building blocks than letters in *SpeechBlocks*.
- Collaborated with colleagues on 4 studies involving different versions of *SpeechBlocks*
- Participated in SemEval competition on Stance Detection in 2016

Georgia Tech

Atlanta, GA

Research Assistant, Prof. Brian Magerko

2012 – 2014

- Implemented visual rendering of a virtual dance companion and participated in the development of underlying AI
- Participated in research on a co-creative drawing assistant
- Developed a model for SemEval competition on Semantic Dependency Parsing in 2014

Novosibirsk State University

Novosibirsk, Russia

Research Assistant, Profs. Elena Sidorova, Dmitry Palchunov

2005 – 2011

- Conducted research on semantic parsing and knowledge representation.

Research Assistant, Dmitry Ushakov

- Explored automatic generation of constraints for intuitive editing of 3D geometry in CAD software.

PUBLICATIONS

Journal Articles

(under review) Nazare, J., Hershman, A., **Sysoev, I.**, Ballinger, S., Saveski, M., Walker, M. & Roy, D. (2022). Technology-Assisted Coaching: A System for Children's Literacy Learning. Submitted to *Computers & Education*.

Sysoev, I., Gray, J. H., Fine, S., Makini, S.P. & Roy, D. (2022). Child-driven, machine-guided: Automatic scaffolding of constructionist-inspired early literacy play. *Computers & Education*.

Sysoev, I., Gray, J. H., Fine, S., & Roy, D. (2021). Designing building blocks for open-ended early literacy software. *International Journal of Child-Computer Interaction*.

Sysoev I. (2012) A Stereotype-Based Model of Reasoning. *Program Engineering*, 9/2012, ISSN 2220-3397, New Technologies, Moscow. Russia. (in Russian)

Conference Proceedings

(under review) **Sysoev, I.**, Gray, J. H., Fine, S., Makini, S.P. & Roy, D. (2022). What would you like to spell? Input mechanisms for open-ended early literacy play. Submitted to the *2022 Conference on Interaction Design and Children*.

Hershman, A., Nazare, J., **Sysoev, I.**, Fratamico, L., Buitrago, J., Soltangheis, M., ... Roy, D. (2018). Family Learning Coach: Engaging Families in Children's Early Literacy Learning with Computer-Supported Tools. *Proceedings of International Conference on Computers and Education* 2018.

Nominated for best paper award.

Nazare, J., Hershman, A., **Sysoev, I.**, & Roy, D. (2017). Bilingual SpeechBlocks: Investigating How Bilingual Children Tinker with Words in English and Spanish. *Proceedings of the Annual Symposium on Computer-Human Interaction in Play*

Sysoev, I., Hershman, A., Fine, S., Traweek, C., & Roy, D. (2017). SpeechBlocks: A Constructionist Early Literacy App. *Proceedings of the 2017 Conference on Interaction Design and Children*

Vijayaraghavan, P., **Sysoev, I.**, Vosoughi, S., & Roy, D. (2016). DeepStance at SemEval-2016 Task 6: Detecting Stance in Tweets Using Character and Word-Level CNNs. *Proceeding of SemEval (2016)*

Davis, N. M., Popova, Y., **Sysoev, I.**, Hsiao, C.-P., Zhang, D., & Magerko, B. (2014). Building Artistic Computer Colleagues with an Enactive Model of Creativity. *Proceedings of International Conference on Computational Creativity 2014*, 38–45.

Jacob, M., Coisne, G., Gupta, A., **Sysoev, I.**, Verma, G. G., & Magerko, B. (2013). Viewpoints AI. *Proceedings of Ninth Artificial Intelligence and Interactive Digital Entertainment Conference*.

Theses

Sysoev, I. (2020). *Digital Expressive Media for Supporting Early Literacy through Child-Driven, Scaffolded Play*. Doctoral dissertation, MIT Media Lab.

Sysoev I. (2011) *Applying a Variational Constraint Solver to 3D Geometry Editing*. Master's thesis, Novosibirsk State University. (in Russian)

Sysoev I. (2009) *Applying Lazy Evaluation to Semantic Text Analysis*. Bachelor's thesis, Novosibirsk State University. (in Russian)

Presentations and Posters

Nazare, J., Hershman, A., **Sysoev, I.**, Fratomico, L., Buitrago, J., Soltangheis, M., ... Roy, D. (2018). Child-coach-parent network for early literacy learning. *International Society of the Learning Sciences*

Sysoev, I., Hershman, A., Fine, S., Roy, D., Soltangheis, M., & Fitzpatrick, B. (2016). Exploring SpeechBlocks: Piloting a Constructionist Literacy App with Preschool Children. Talk at *2016 Convention of American Speech and Hearing Association*

Sysoev, I., Chitloor, R. D., Rajaram, A., Summerlin, R. S., Davis, N., & Walker, B. N. (2013). Middle mercury: an ambient music generator for relaxation. Poster in *Proceedings of the 8th Audio Mostly Conference, 20. ACM*.

Sysoev I. (2011). Applying a variational constraints solver to 3D geometry editing. *XLIX International Scientific Students Conference, Novosibirsk, Russia*. (in Russian) **1st award**.

Sysoev I. (2009). Applying lazy evaluation to semantic text analysis. *XLVII International Scientific Students Conference, Novosibirsk, Russia*. (in Russian) **2nd award**.

INVITED TALKS

Fall 2019, Spring 2020, Fall 2020

Guest lecture at *Language Literacy* class (Northeastern University)

TEACHING EXPERIENCE

Designing Learning Technologies for Children (MAS.S65)

Spring 2022

Co-Instructor

- Led the development of the course
- Leading 8 out of 15 theoretical sessions
- Supporting students' individual projects, academic and administrative questions

Learning in the Flow of Everyday Life (MAS.S70)

Spring 2018

Teaching Assistant

- Collaborated with instructors on designing the class, including considerations on format, evaluation, set of topics and invited speakers.
- Lectured one of the sessions and facilitated both in-classroom and online discussions.
- Processed students' homework and answered academic and administrative questions.
- Overall Rating: 6.5/7.

Depolarization by Design (MAS.S62)

Fall 2017

Teaching Assistant

- Took notes and summarized the content of each session for students' usage. Not rated.

Introduction to Social Machines (MAS.S65)

Spring 2015

Teaching Assistant

- Advised students without NLP background on basics of NLP for usage in their projects. Not rated.

MENTORSHIP

MIT Undergraduate Research Opportunities Program

2020-present, 2018, 2016

- Advised 7 MIT undergraduate students who worked on projects related to applying AI techniques to support child-driven learning.

SpeechBlocks

Spring 2019

- Supervised a group of 6 Northeastern University students who took observation notes.

FELLOWSHIPS & AWARDS

- Fulbright Visiting Graduate Student Scholarship 2012 – 2014
- Donald Jackson Fellowship 2013
Awarded to 3 Georgia Tech College of Computing MS students yearly
- Baker Atlas Fellowship 2009
Awarded to students and alumni of Novosibirsk State University

ACADEMIC SERVICE

Journal Article Referee

IJITDM (International Journal of Information Technology and Decision Making)

Conference Paper Referee

SemEval; CHI; ACM Creativity and Cognition

INDUSTRY EXPERIENCE

Ledas Ltd. / Bricsys Technologies Russia

Software Developer

Novosibirsk, Russia

2009 – 2012

- Developed CAD software on C++
- Researched a novel approach to modeling in CAD systems
- Participated in designing the architecture of the system

COMMUNITY INVOLVEMENT

MIT Graduate Dorms

Recycling and Gardening Chair at Tang Hall

Cambridge, MA

2017 – 2019

- Facilitated reduction in contamination of recycling streams by setting up information materials and events.
- Maintained implementation of Trash2Treasure reuse program at the dorm.
- Distinguished as an outstanding chair by Heads of House.

MIT Graduate Student Council

Sustainability Subcommittee Member

Cambridge, MA

2016 – 2019

- Participated in the creation of an online course on sustainable practices for MIT students. Co-designed a survey (taken by about 490 students) to assess students' knowledge of sustainable practices.

SKILLS

- Designing learning technologies for children
- Qualitative and quantitative research
- Programming languages: C++, C#, Java, JavaScript, Python, Lisp, Haskell, MATLAB
- Object-oriented design and functional programming
- Game development in Unity
- Android development
- Machine learning, AI and NLP
- Robotics: Jibo platform
- Oral and written proficiency in Russian.
- Drawing and painting using traditional and digital media; digital animation

SELECT COURSEWORK

Massachusetts Institute of Technology

Computational Cognitive Science; Statistical Learning Theory; Designing for Learning by Creating; Creative Learning Technologies

Georgia Institute of Technology

Advanced Game AI; Artificial Intelligence; Cognitive Science - Special Topics; Computational Creativity; Interactive Fiction; Knowledge-Based AI; Machine Learning; Natural Language Processing

Novosibirsk State University

Algebra, Analytic Geometry and Numbers Theory; Analysis of Algorithms; Calculus; Decision Theory; Mathematical Logics; Mathematical Optimization; Methods of Discrete Mathematics; Neurocomputers; Systems and Methods of Artificial Intelligence; Theory of Probability and Mathematical Statistics

REFERENCES

Deb Roy: PhD advisor, instructor of the classes TA-ed by Ivan. *Research and teaching reference.*
Professor of Media Arts and Sciences, MIT Media Lab.
dkroy@media.mit.edu

James Gray: research collaborator, instructor of MAS.S70, TA-ed by Ivan. *Research and teaching reference.*
Research scientist at MIT Media Lab. Previously, VP of Learning Design at Sesame Workshop and Director of Learning at LeapFrog Enterprises.
jhgray@media.mit.edu

Mitchel Resnick: PhD thesis committee member. *Research reference.*
Lego Papert Professor of Learning Research, MIT Media Lab.
mres@media.mit.edu

Catherine Snow: PhD thesis committee member. *Research reference.*
Patricia Albjerg Graham Professor of Education, Harvard Graduate School of Education
catherine_snow@gse.harvard.edu

Susan Fine: research collaborator. *Research reference.*
Assistant Clinical Instructor, Language and Literacy Program at Northeastern University
s.fine@northeastern.edu