

AIED 2013 Workshops Proceedings  
Volume 9

**The First Workshop on AI-supported  
Education for Computer Science  
(AIEDCS 2013)**

Workshop Co-Chairs:

**Nguyen-Think Le<sup>1</sup>**  
**Kristy Elizabeth Boyer<sup>2</sup>**  
**Beenish Chaudhry<sup>3</sup>**  
**Barbara Di Eugenio<sup>4</sup>**  
**Sharon I-Han Hsiao<sup>5</sup>**  
**Leigh Ann Sudol-DeLyser<sup>6</sup>**

<sup>1</sup>*Clausthal University of Technology, Germany*

<sup>2</sup>*North Carolina State University, USA*

<sup>3</sup>*Indiana University Bloomington, USA*

<sup>4</sup>*University of Illinois Chicago, USA*

<sup>5</sup>*Columbia University, USA*

<sup>6</sup>*New York University, USA*

<https://sites.google.com/site/aiedcs2013/>

## Preface

The global economy increasingly depends upon Computer Science and Information Technology professionals to maintain and expand the infrastructure on which business, education, governments, and social networks rely. Demand is growing for a global workforce that is well versed and can easily adapt ever-increasing technology. For these reasons, there is increased recognition that computer science and informatics are becoming, and should become, part of a well-rounded education for every student. However, along with an increased number and diversity of students studying computing comes the need for more supported instruction and an expansion in pedagogical tools to be used with novices. The study of computer science often requires a large element of practice, often self-guided as homework or lab work. Practice as a significant component of the learning process calls for AI-supported tools to become an integral part of current course practices.

Designing and deploying AI techniques within computer science learning environments presents numerous challenges. First, computer science focuses largely on problem solving skills in a domain with an infinitely large problem space. Modeling possible problem solving strategies of experts and novices requires techniques that address many types of unique but correct solutions to problems. In addition, there is growing need to support affective and motivational aspects of computer science learning, to address widespread attrition of students from the discipline. AIED researchers are poised to make great strides in building intelligent, highly effective AI-supported learning environments and educational tools for computer science and information technology. Spurred by the growing need for intelligent learning environments that support computer science and information technology, this workshop will provide a timely opportunity to present emerging research results along these lines.

June, 2013

Nguyen-Thinh Le, Kristy Elizabeth Boyer, Beenish Chaudhry,  
Barbara Di Eugenio, Sharon I-Han Hsiao, and Leigh Ann Sudol-DeLyser

## Program Committee

Co-Chair: Nguyen-Thinh Le, *Clausthal University of Technology, Germany*  
(nguyen-thinh.le@tu-clausthal.de)

Co-Chair: Kristy Elizabeth Boyer, *North Carolina State University, USA*  
(keboyer@ncsu.edu)

Co-Chair: Beenish Chaudry, *Indiana University Bloomington, USA*  
(bchaudry@indiana.edu)

Co-Chair: Barbara Di Eugenio, *University of Illinois Chicago, USA*  
(bdieugen@uic.edu)

Co-Chair: Sharon I-Han Hsiao, *Columbia University, USA*  
(ih2240@columbia.edu)

Co-Chair: Leigh Ann Sudol-DeLyser, *New York University, USA*  
(leighhansudol@gmail.com)

James Lester, *North Carolina State University, USA*

Niels Pinkwart, *Clausthal University of Technology, Germany*

Peter Brusilovsky, *University of Pittsburgh, USA*

Michael Yudelson, *Carnegie Learning, USA*

Tomoko Kojiri, *Kansai University, Japan*

Fu-Yun Yu, *National Cheng Kung University, Taiwan*

Tsukasa Hirashima, *Hiroshima University, Japan*

Kazuhisa Seta, *Osaka Prefecture University, Japan*

Davide Fossati, *Carnegie Mellon University, Qatar*

Sergey Sosnovsky, *CeLTech, DFKI, Germany*

Tiffany Barnes, *North Carolina State University, USA*

Chad Lane, *USC Institute for Creative Technologies, USA*

Bruce McLaren, *Carnegie Mellon University, USA*

Pedro José Muñoz Merino, *Universidad Carlos III de Madrid, Spain*

Wei Jin, *University of West Georgia, USA*

John Stamper, *Carnegie Mellon University, USA*

Sajeesh Kumar, *University of Tennessee, USA*

## Table of Contents

Sequential Patterns of Affective States of Novice Programmers <i>Nigel Bosch and Sidney D’Mello.</i>	1
Towards Deeper Understanding of Syntactic Concepts in Programming <i>Sebastian Gross, Sven Strickroth, Niels Pinkwart and Nguyen-Thinh Le.</i>	11
An Intelligent Tutoring System for Teaching FOL Equivalence <i>Foteini Grivokostopoulou, Isidoros Perikos and Ioannis Hatzilygeroudis.</i>	20
Informing the Design of a Game-Based Learning Environment for Computer Science: A Pilot Study on Engagement and Collaborative Dialogue <i>Fernando J. Rodriguez, Natalie D. Kerby and Kristy Elizabeth Boyer.</i>	30
When to Intervene: Toward a Markov Decision Process Dialogue Policy for Computer Science Tutoring <i>Christopher M. Mitchell, Kristy Elizabeth Boyer and James C. Lester.</i>	40
Automatic Generation of Programming Feedback; A Data-Driven Approach <i>Kelly Rivers and Kenneth R. Koedinger.</i>	50
JavaParser; A Fine-Grain Concept Indexing Tool for Java Problems <i>Roya Hosseini and Peter Brusilovsky.</i>	60