

SUPSI

Assessing computational thinking skills with intelligent tutoring systems

The CT-cube: a framework for the design and the assessment of computational thinking activities

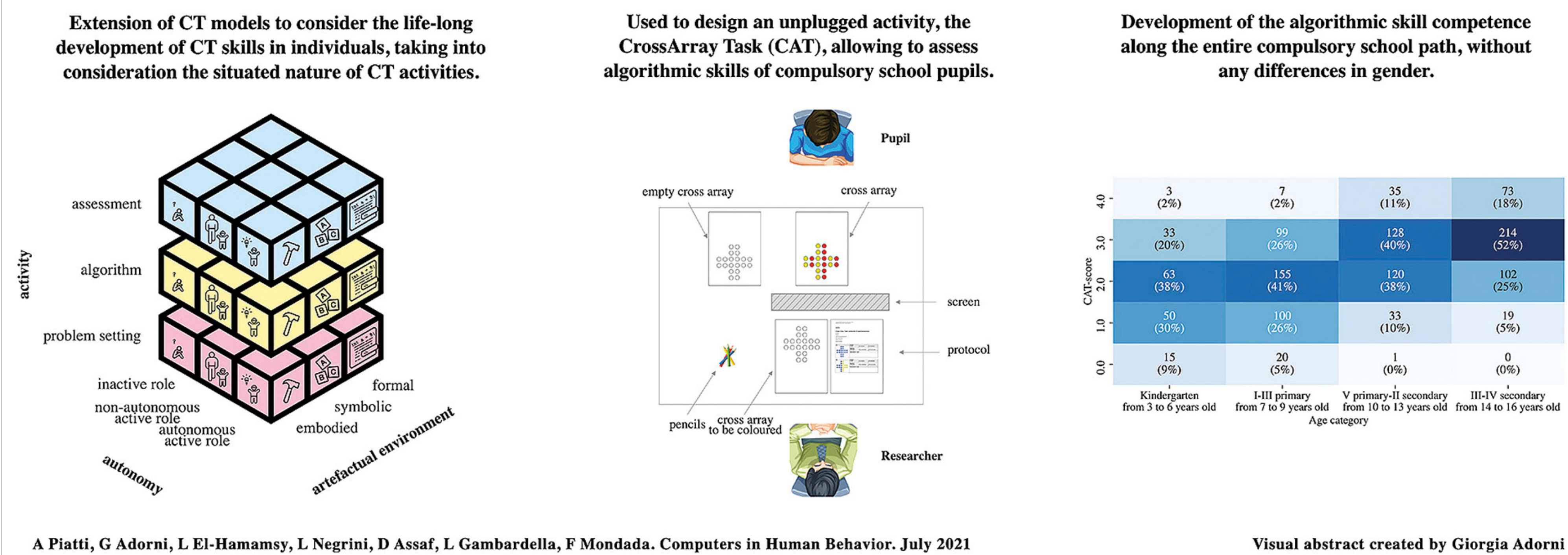


Figure 1. The Computational Thinking Cube (CT-cube) is a framework based on the original definition of CT and on the situated cognition theory, that has been used to design an unplugged assessment activity, the cross array task (CAT), that has been used to assess the algorithmic skills of 109 compulsory school pupils aged 3 to 16 in the Canton of Ticino.

The project: in this project, we focus on the large-scale assessment of computational thinking (CT) skills. We aim at (i) defining an age-based competence model for CT for general use, (ii) identify a set of standardised problems allowing to assess CT skills in pupils of different ages, (iii) developing a state of the art probabilistic intelligent tutoring and assessment system that supports pupils while solving the problems in a class and measures at the same time their CT skills, enabling thus a semi-automatic large scale monitoring and (iv) validating the developed framework, collecting data about the effectiveness of several measures that have been implemented for the development of CT skills. In particular, our meth-

odology will be tested on several classes in compulsory schools of the three linguistic regions. The duration of the project is 4 years, from October 2020 to September 2024.

Intermediate results: we have defined a theoretical framework, called CT-cube, allowing to take into consideration the developmental and situated nature of computational thinking, and we have applied it to design an unplugged activity for the assessment of algorithmic skills of compulsory school pupils. An experimental study in several compulsory school classes in Ticino has allowed to show concretely the effectiveness of the proposed framework (Piatti et al. 2022).

Next steps: a general model for computational thinking problems (journal paper under review), a Bayesian networks model for the ITAS (conference paper under review), online version of the CAT.

Contact
Alberto Piatti
alberto.piatti@supsi.ch

Funding acknowledgements
Swiss National Science Foundation (SNF)

Partner
Dalle Molle Institute for Artificial Intelligence (USI and SUPSI)
École polytechnique fédérale de Lausanne (EPFL)
Pädagogische Hochschule der FHNW (PH-FHNW)