

# Integrating Adversarial Thinking Into Fundamentals of Computer Science Courses

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**Need for Cybersecurity Concepts in Software Development.** There is a national deficiency in software developers possessing adversarial thinking abilities is evident within the field of computing. This scarcity has created a disconnect between Career Technical Education (CTE) and Academic Degrees. On one hand, many IT professionals who come from CTE programs have a strong grasp of cybersecurity, including areas like forensics, intrusion detection systems, firewalls, and networks, but they lack the essential software development skills. Conversely, computer scientists and developers with academic degrees excel in software development but often lack the crucial adversarial thinking skills. Consequently, there is a pressing demand for software developers who combine adversarial thinking abilities with the capacity to design, develop, and implement secure software, thereby fortifying organizational computing systems.

**Adversarial Thinking is the Computational Thinking++.** In the context of the Cybersecurity Curricular Guidelines (CSEC 2017) [1], Adversarial Thinking is recognized as a foundational concept that permeates various domains within the cybersecurity curriculum. However, given the evolving landscape of computer science education, including the integration of emerging fields like cybersecurity sciences, the appeal of teaching this concept across all computing disciplines varies. One specific course, often referred to as *Fundamentals of Computer Science* or *CS 1*, is offered in both two-year and four-year educational institutions. This course caters not only to computer science majors but also to students pursuing computing-related degrees such as data analytics, cybersecurity, data science, or various CS + X programs. The CS 1 has become a cornerstone for many computing disciplines in contemporary education. Given the widespread popularity of CS 1, there exists a demand to introduce concepts that extend beyond basic computational thinking. In this paper, we put forth the notion of Adversarial Thinking, a concept that, when coupled with computational thinking, can equip future programmers with the skills to consider risk analysis at every stage of code development.

**The Contribution.** The xAI Institute at El Paso Community College, actively is researching the identification of adversarial thinking concepts within the core fundamentals of computer science. In this paper, we delve into the aspects related to CS 1.

## References

- [1] Joint Task Force on Cybersecurity Education. *Cybersecurity Curricula 2017: Curriculum Guidelines for Post-Secondary Degree Programs in Cybersecurity*. Association for Computing Machinery, New York, NY, USA, 2018.