

IMPROVING **CYBERSECURITY** EDUCATION IN PROGRAMMING COURSES AT UNIVERSITIES

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MOTIVATION

- ❖ Many security issues are caused by **defects in the code**.
- ❖ Software should be developed **securely** from the very beginning.
- ❖ University students **should be introduced** to security concepts at courses.

AIM

A new knowledge: a better way to teach cybersecurity at programming courses.

QUESTIONS

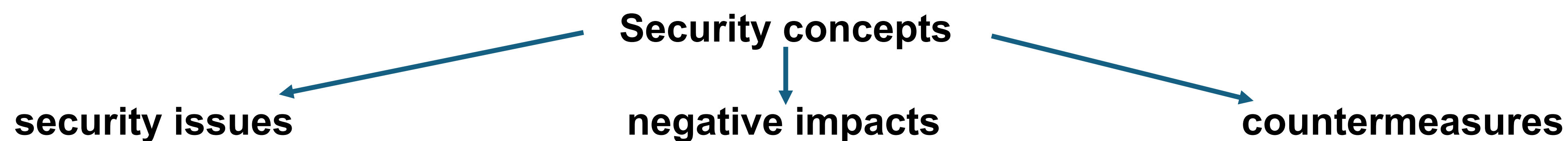
1: Which cybersecurity concepts are **already taught** at programming courses & what can be improved?

2: Which cybersecurity-related concepts **should be added** to course material?

3: **How to improve** course materials to raise awareness of cybersecurity among students & teach them to program with security in mind?



CURRENT RESULTS



- ❖ **Future studies should:**
 - ❖ **cover** security issues, negative impacts & countermeasures,
 - ❖ apply evaluation techniques that **examine students' knowledge**.
- ❖ **Future studies could:**
 - ❖ study how to integrate security topics into **advanced courses**,
 - ❖ create a **holistic security framework** suitable for learning security concepts at programming courses,
 - ❖ study security topics applicable to **Python**.

WHAT'S NEXT?

- ❖ **Create a conceptual tool** to update an existing programming course & include security concepts.

Features:

- ❖ **concept mapping:** existing topics & relevant security concepts,
- ❖ **minimal impact** on workload at a course,
- ❖ security concepts are integrated **gradually**.
- ❖ **Apply** the tool (**case study**):
 - ❖ **update** course materials & **add** security requirements to course assignments,
 - ❖ **evaluate** students' assignments.
- ❖ What should be **improved**?

REFERENCES

Torbunova, Alina, Adnan Ashraf, and Ivan Porres. "A Systematic Mapping Study on Teaching of Security Concepts in Programming Courses." *arXiv preprint arXiv:2407.07511* (2024).

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