

## Exercises

Select **only two** of the below exercises.

You can submit your solutions in English or in Polish.

**deadline:** December 7, 2018.

Please send your solutions to: `cezary.kaliszyk@uibk.ac.at`

### Exercise 1: ATP Calculi

Use an ordering to restrict the possible inference steps in the lean connection tableau calculus (the calculus presented in the third part of the lecture). What properties of the ordering preserve soundness and completeness?

**Hint:** *Consider two properties: is the ordering closed under substitution and is it closed under context. Do these have an impact on the soundness and completeness? Give short proof outlines.*

### Exercise 2: Premise Selection

Read a short introduction to SVM:

D. Fradkin, I. Muchnik “Support vector machines for classification”

Propose a mechanism to apply SVM to premise selection. How can you adapt the algorithm to make it more robust for the problem?

### Exercise 3: ATP Learning Problems

Read a short introduction to the CDCL Solver Chaff:

Chaff: Engineering an Efficient SAT Solver

- What tasks could be performed with the help of machine-learning in a CDCL solver?

**Hint:** *Consider restarts; clause deletion; clause learning; variable selection. Give short answers whether you expect these to be learnable and if they could be predicted efficiently.*

- Describe a scheme to characterize the state and select a variable and polarity efficiently.