Summary 1 - March 4, 2024

Past Week

- Read the first three chapters of: *"Structural Results for Total Search Complexity Classes with Applications to Game Theory and Optimisation" from Hollender* This gave a good introduction into the definition of the different complexity classes, in particular **TNFP**, **PPAD**, **PLS** and **EOPL**.
- Also read the relevant parts of: *"Tarski's Theorem, Supermodular Games, and the Complexity of Equilibria" from Etessami* et al. This gave an introduction of the Tarski problem and in particular the proofs of the membership in **PLS** and the idea of the membership in $\mathbf{P}^{\mathbf{PPAD}} = \mathbf{PPAD}$. In particular I played around with the reduction onto the **PLS** class, and tried the naive approach of using this reduction to reduce the problem to the **EOPL** class. $\mathbf{P}^{\mathbf{PPAD}}$.
- Skimmed over the paper *"Propositional proofs and reductions between NP search problems" from Buss & Johnson*, seems rather difficult but the proof of $\mathbf{P}^{\mathbf{PPAD}} = \mathbf{PPAD}$ might be general enough to be used on the **EOPL** class.

Ideas for the next week

- Read *"Propositional proofs and reductions between NP search problems" from Buss & Johnson* in more detail, and in particular try to understand the proof of $\mathbf{P}^{\mathbf{PPAD}} = \mathbf{PPAD}$, and see if it can be applied to the **EOPL** class, i.e. does it hold that $P^{\mathbf{EOPL}} = \mathbf{EOPL}$?
- Try to find a reduction from Tarski to $\mathbf{P}^{\mathbf{EOPL}} = \mathbf{EOPL}$, which should be easier.

Administrative Points

- What are the expectations from your side?
- How often should we meet? When will Prof. Gärtner be available?
- Will there be a final presentation?
- How spontaneously are you available for questions?
- Problems with my Legi.