



Timo Kötzing

SS 12

Exercises for Limits of Computational Learning

<http://www.mpi-inf.mpg.de/departments/d1/teaching/ss12/learning/>

Assignment 4

Deadline: Wed 23.5.2012, 10am

Exercise 1 (4pts) Let $r \in \mathcal{R}$ be such that, for all n , $\varphi_{r(n)}$ is total. Let $\mathcal{S} = \{\varphi_{r(n)} \mid n \in \mathbb{N}\}$. Show that

$$\mathcal{S} \in \tau(\mathbf{T})\mathbf{GEx}.$$

Exercise 2 (4pts) Show that

$$\mathcal{R}\mathbf{GEx} = \mathbf{GEx}.$$

Exercise 3 (4pts) Show that it is not the case that there is an $f \in \mathcal{R}$ such that, for all e ,

$$\varphi_{f(e)} \in \mathcal{R} \wedge \varphi_{f(e)} \notin \mathbf{GEx}(\varphi_e).$$

This shows that there is no function f which, when given a program for a learner, can find an unidentified total computable function.

Exercise 4 (4pts) Show that

$$\mathcal{S}_{\text{SD}} \cup \mathcal{S}_{\text{FinSup}} \notin \mathbf{GEx}.$$

For this, recall that

$$\mathcal{S}_{\text{FinSup}} = \{g \in \mathcal{R} \mid \forall^\infty x : g(x) = 0\}$$

and

$$\mathcal{S}_{\text{SD}} = \{g \in \mathcal{R} \mid \varphi_{g(0)} = g\}.$$