

## Neural and Evolutionary Learning

Class 3 - Geometric Semantic Genetic Programming

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## Geometric Semantic Genetic Programming

	GA	Tree-based GP	GSGP
Genome	Constant length	Lisp-like tree	Lisp-like tree
Task type	Optimization	Many tasks, including ML	Many tasks, including ML
Population initialization	Random values	Random trees*	Random trees*
Crossover	"Blind" genotype variation**	"Blind" genotype variation**	Semantic (phenotype-based) genotype variation
Mutation	"Blind" genotype variation**	"Blind" genotype variation**	Semantic (phenotype-based) genotype variation

#### **Important!**

Remind that the <u>neighbourhood of the fitness landscape is defined by the genetic operators</u>. Therefore, the use of these Geometric Semantic operators enables the problem to be optimized in the error space, transforming any problem into a CONO one.













# Geometric Semantic Genetic Programming

GSGP Crossover

$$T_{XO} = T_1 \times T_R + T_2 \times (1 - T_R)$$

**GSGP** Mutation

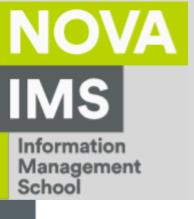
$$T_M = T + ms \times (T_{R1} - T_{R2})$$





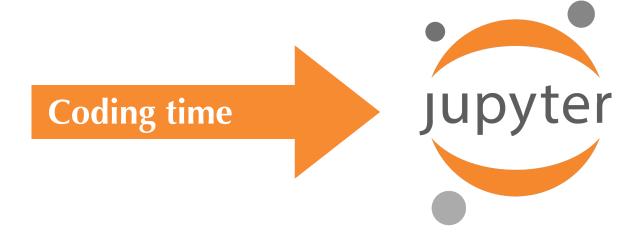






# slim\_gsgp NOVA IMS library

Let's take a look at the codes.

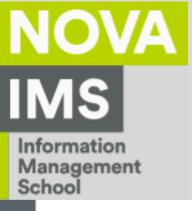












#### Questions?



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