

# Evolutionary Program Synthesis from Refined and Dependent types

Paulo Santos, Alcides Fonseca, Vasco Vasconcelos, Andreia Mordido, Sara Silva

LASIGE, Faculdade de Ciências, Universidade de Lisboa, Portugal

## Motivation

The software market revenue worldwide in 2018 was estimated in 456 billion U.S. Dollars and it is projected to grow to 507 until 2021. The focal activity of this industry is the maintenance and development of software.

Program Synthesis is the task of generating a program that fulfils partially or completely a specification, allowing the development of more **reliable**, **secure**, **faster** and **cheaper** software.

## Synthesis of low polygon Mona Lisa in $\mathcal{A}EON$

**original** : `Image = loadImage("monalisa.jpg", 75, 150)` ← Load the original image.

```
evolveImage : {img : Image | width(original) == width(img) and
height(original) == height(img) and
polygons(img) < 500 and
@minimize (difference(original, img))} {
```

- 1 **Predicate 1 and 2**  
Ensures the correct width and length of the output image.
- 2
- 3 **Predicate 3**  
Limits the amount of polygons to ensure it is a low polygon image.
- 4 **Predicate 4**  
Minimizes the difference between both images.

## Synthesize complete and partial programs from refined and dependent types

