





#### Concept

- 3D-print concrete modulus for a complex-shaped beam
- Externally applied / post applied bars
- Take advantage of optimization in terms of shapes and in terms of weight vs resistance



□ Idea for a pedestrian bridge

FE preliminary analysis to obtain optimized shape

□ New fixing method (threaded rod)





JAP2000

# NUMERICAL ANALYSIS

#### **Mechanical optimization**

- Tension Compression (strut and tie model)
- Number of segments
- Thickness of concrete layers
- Reinforcement configuration in order to reduce maximum deflection

#### **Considered HP:**

- Simply supported and clamped boundary conditions;
- Tie/contact contsraints among elements ;
- Linear/Non-linear analysis

# NUMERICAL ANALYSIS

#### **Optimized RC beam: double layer**





### NUMERICAL ANALYSIS

#### **Optimized RC beam: steel reinforcement & contact pressure**



# PRINTING PROCESS

Printing time per segment  $\approx$  20 min



### PRINTING PROCESS



#### **ASSEMBLY: FIXING THE REBAR SYSTEM**



**ASSEMBLY: FINAL VIEW** 

