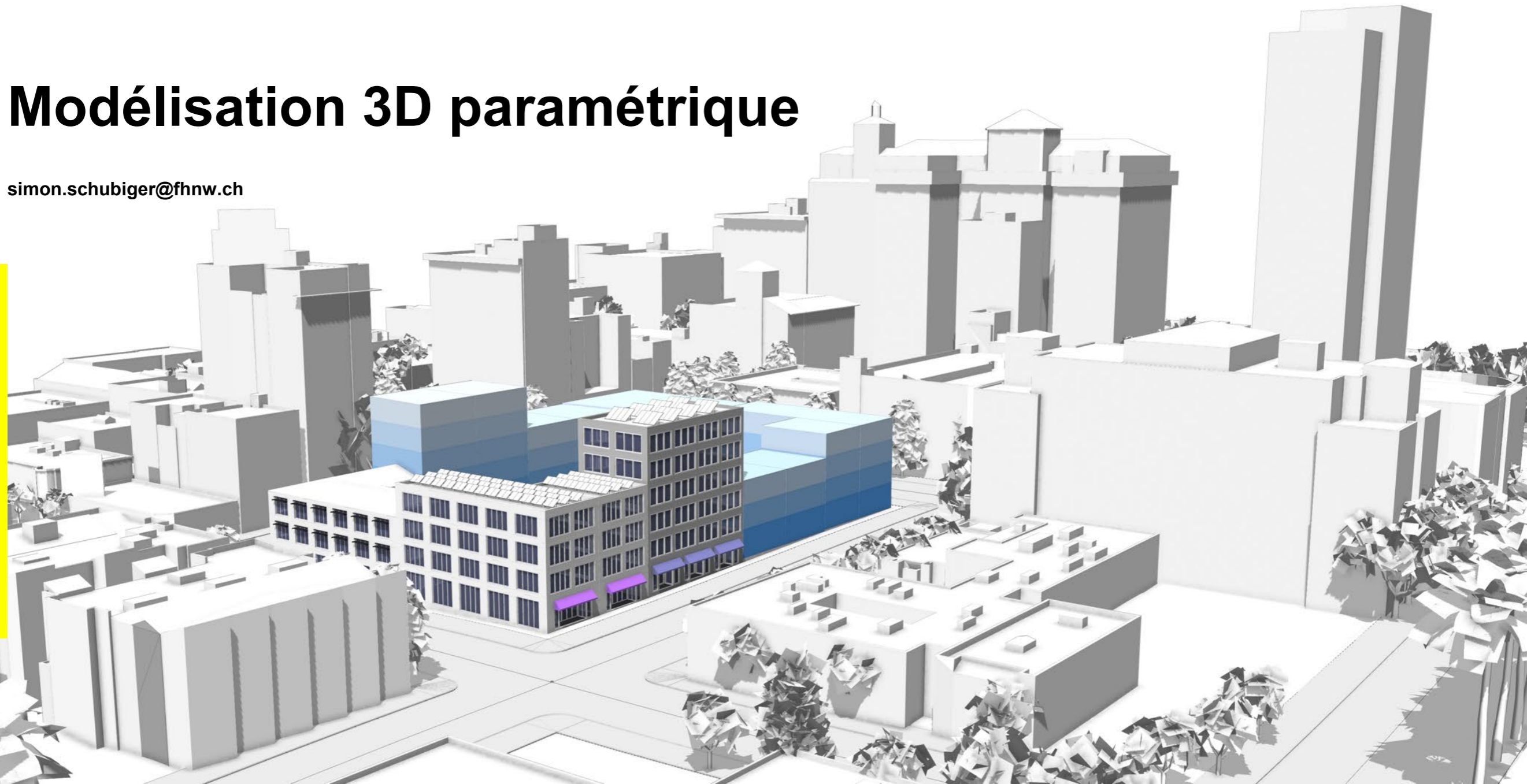


# Modélisation 3D paramétrique

[simon.schubiger@fhnw.ch](mailto:simon.schubiger@fhnw.ch)

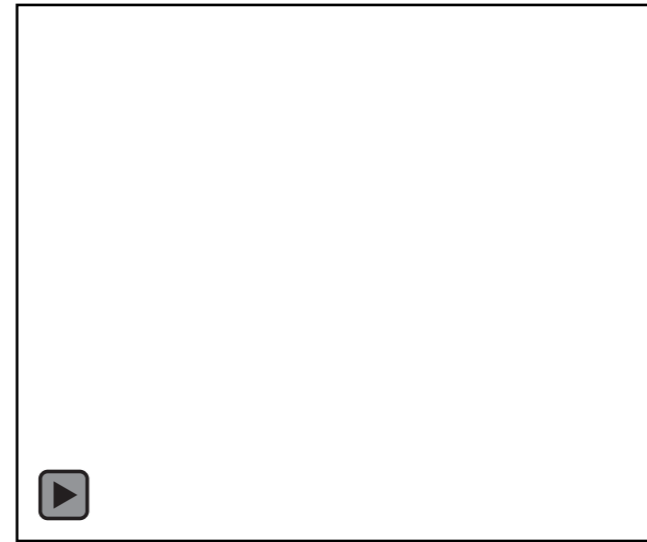
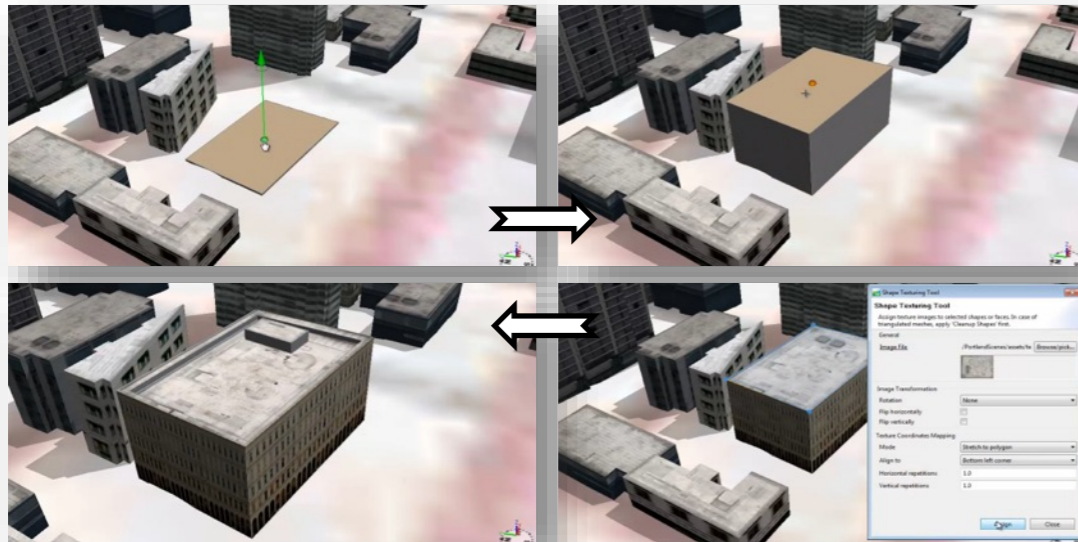


## Thèmes

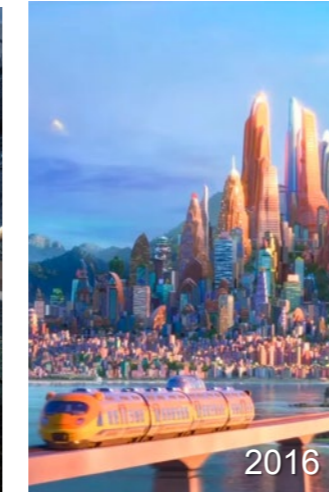
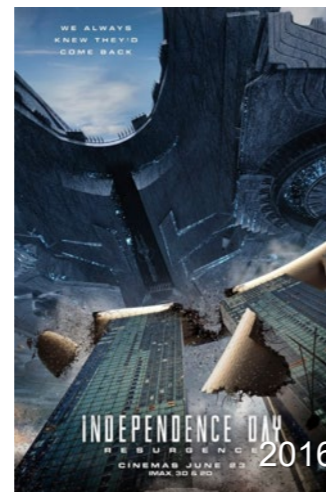
- Modélisation polygonale
- Modélisation paramétrique
- Outils
- Exemples d'application
  - Urbanisme
  - Végétation
  - Analyse
  - Réseaux de circulation
  - Reconstruction

## Modélisation polygonale

- Modélisation des surfaces de délimitation
- Bibliothèque de corps de base géométriques et d'éléments spécialisés
- Large gamme d'outils 2D et 3D



## Modélisation paramétrique



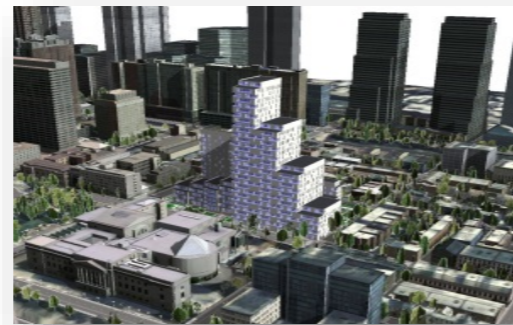
...

## Modélisation paramétrique

- Identification des paramètres
- Identification des chiffres clés



Définition du volume (LoD2)



Façades (LoD3)



Façades / intérieurs détaillés (LoD3/LoD4)

```

attr nStories_Retail =
40%: 1
40%: 2
10%: 3
10%: 4
else: 0

attr nStories_Office =
40%: 2
40%: 3
10%: 4
5%: 5
5%: 6
else: 0

attr nStories_Industrial =
20%: 1
50%: 2
20%: 3
10%: 4
else: 0

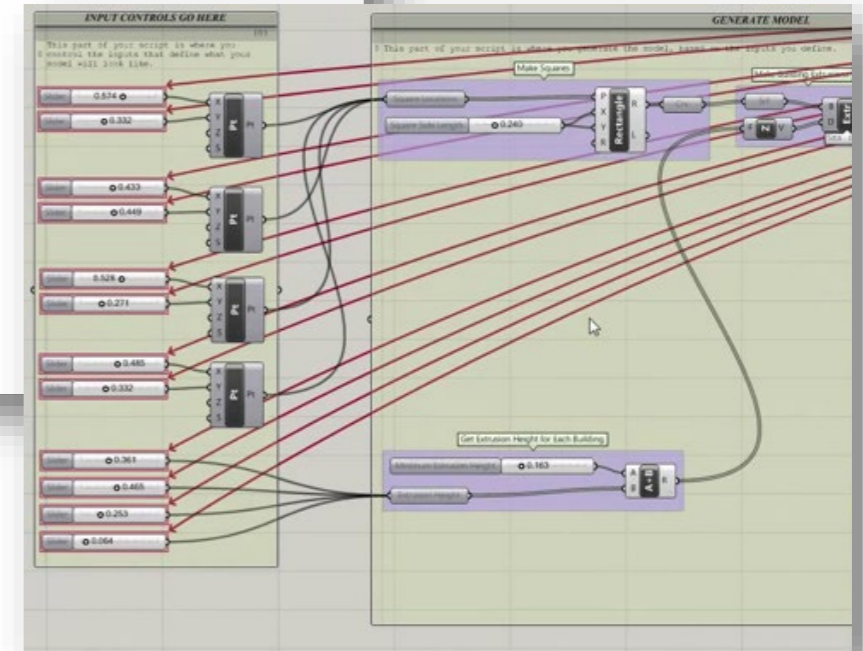
Lot--> SPLIT_LOT

SPLIT_LOT -->
case geometry.area() > 5000 :
case scope.sx > scope.sz :
case scope.sx > 100 :
split(x)(-75:SPLIT_LOT)*
else:
SEL_SET
else :
case scope.sz > 100 :
split(z)(-75:SPLIT_LOT)*
else:
SEL_SET
else :
SEL_SET

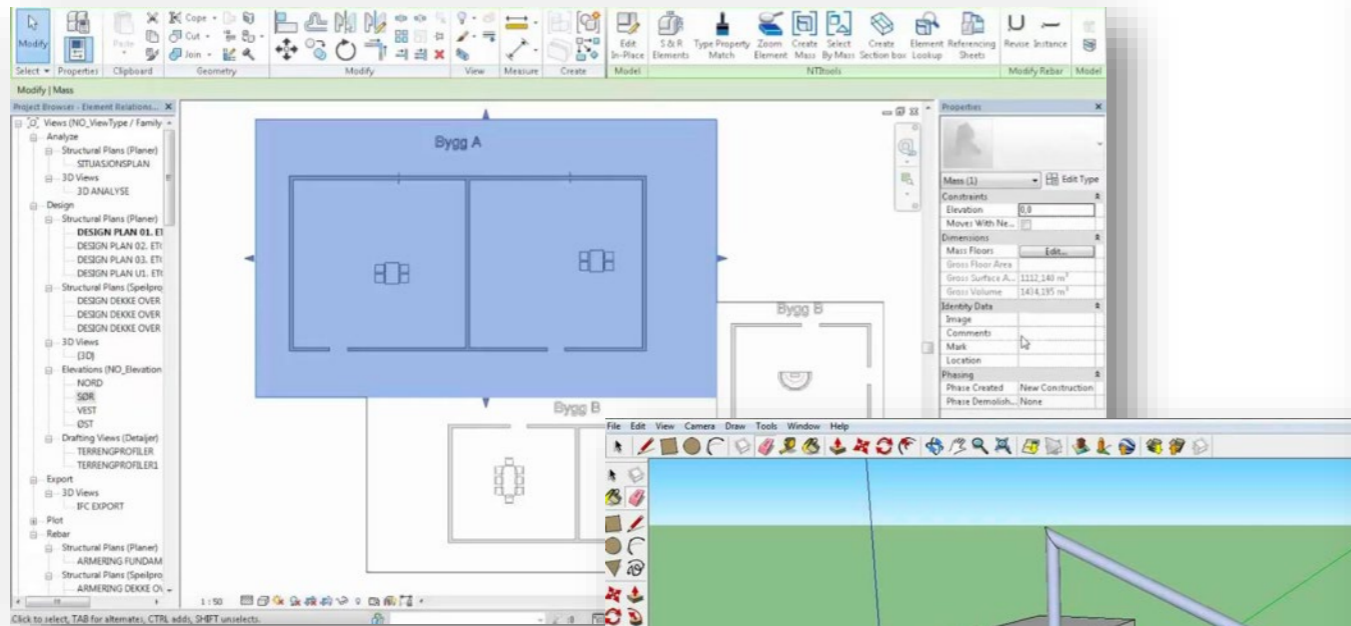
SEL_FLAT-->
case selSet == "set0":
color("#FF4444")
case selSet == "set1":
color("#44FF44")
case selSet == "set2":
color("#4444FF")
else:
NIL

SEL_SET-->
case selSet == "set0":
color("#FF4444")
SEL_BLDG_TYPE
case selSet == "set1":
color("#44FF44")
SEL_BLDG_TYPE
case selSet == "set2":
color("#4444FF")
SEL_BLDG_TYPE
else:
NIL

```

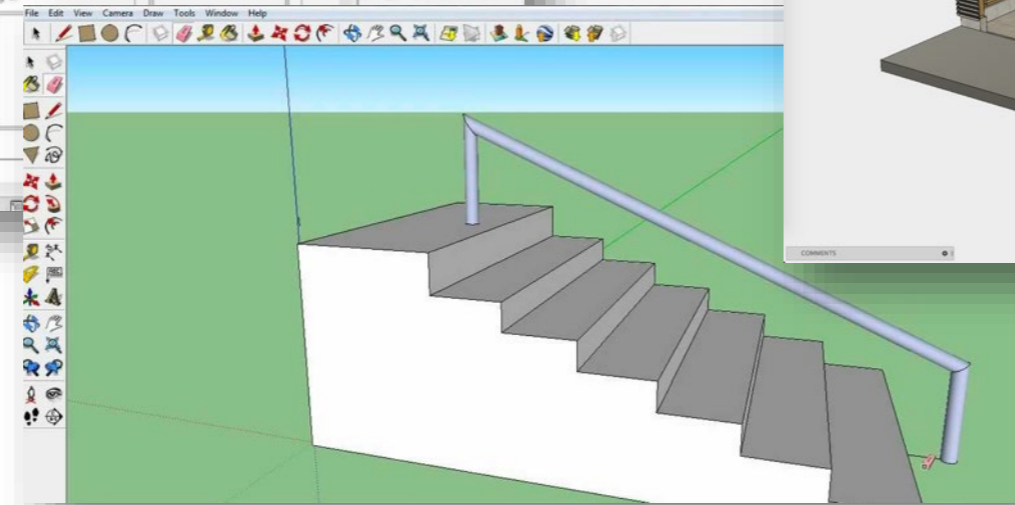
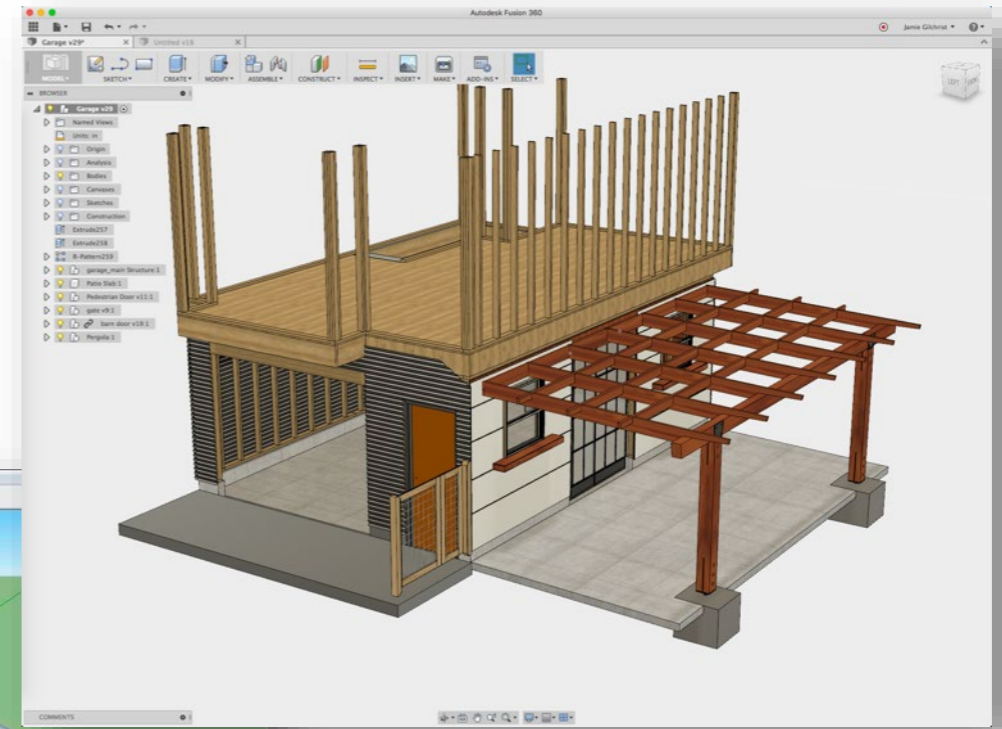


## Outils (exemples)



Autodesk Revit

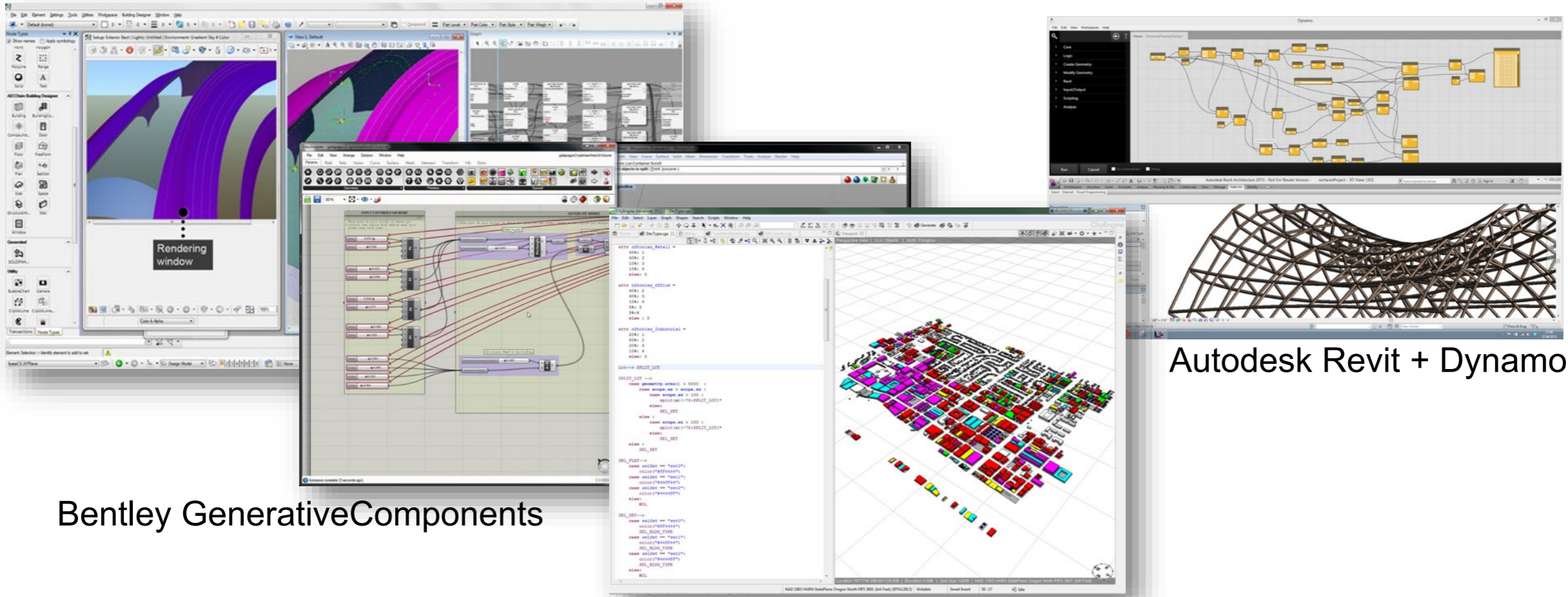
## Autodesk Fusion 360



Trimble SketchUp

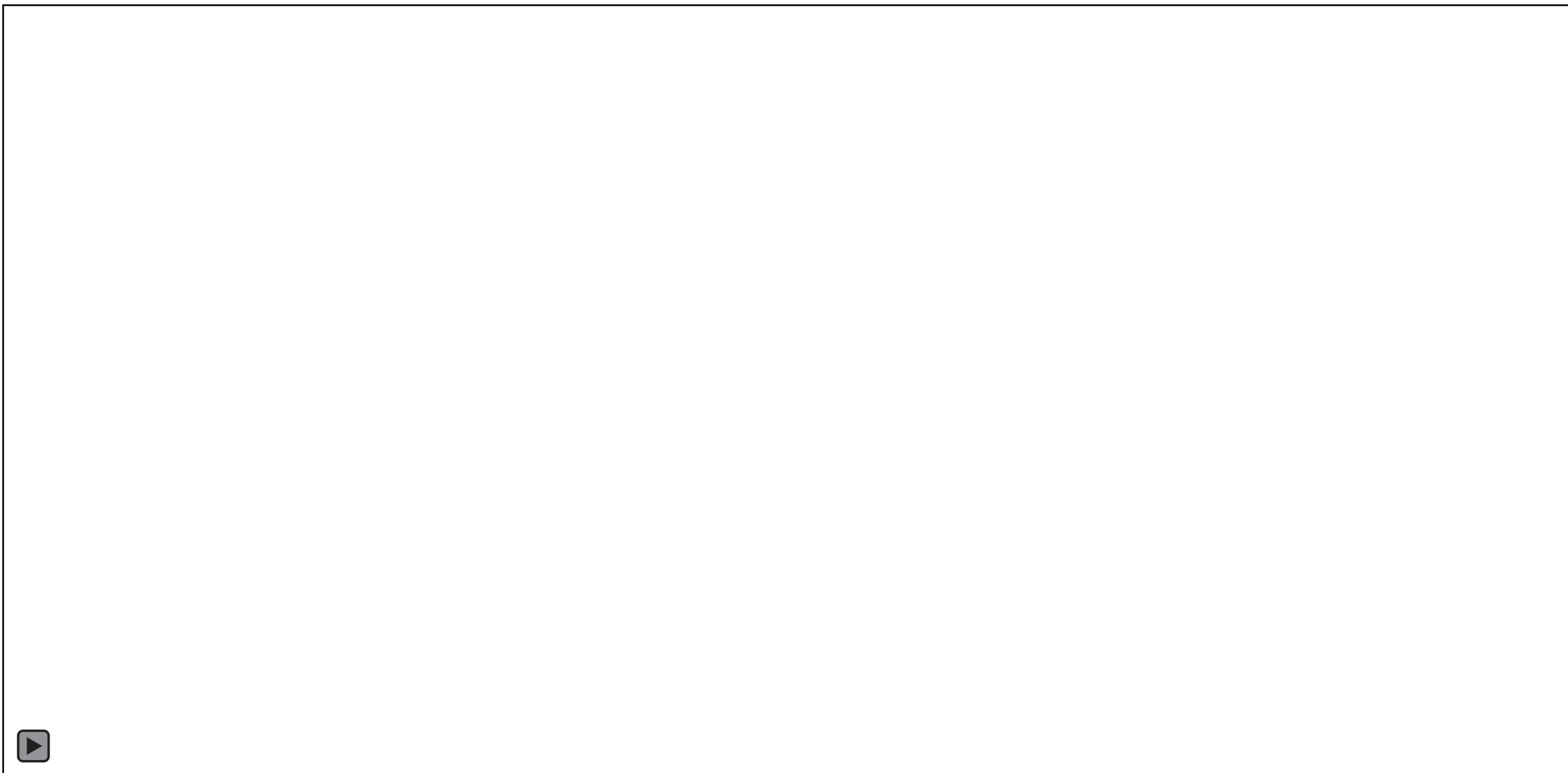
## Outils (exemples)

### Rhinoceros Grasshopper



Bentley GenerativeComponents

Esri CityEngine

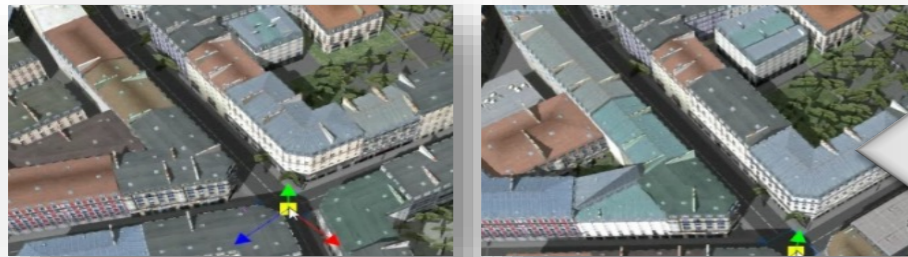




## Application: Urbanisme



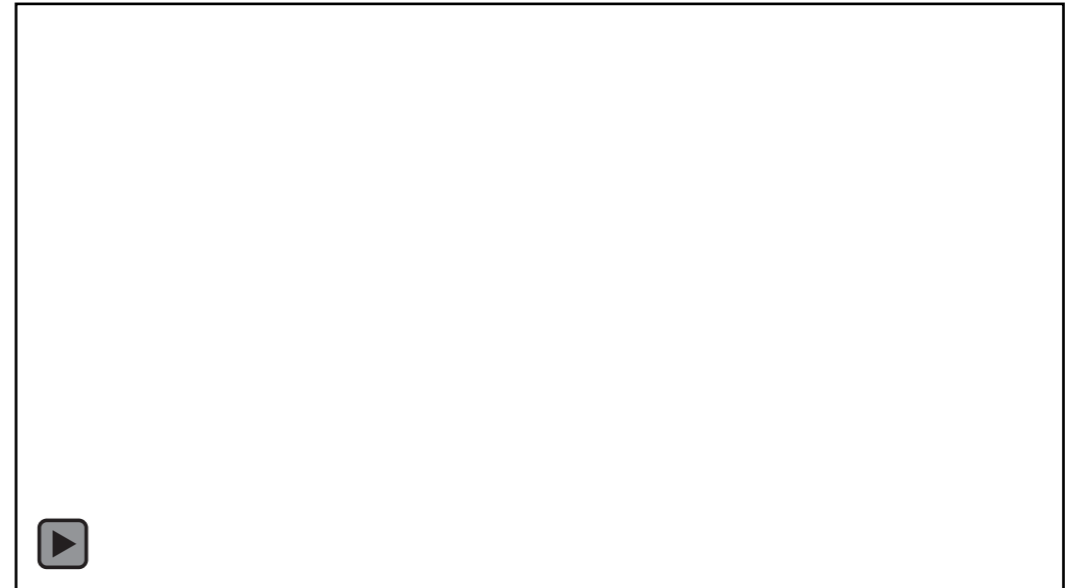
*Géométrie + Attributs + Règles*



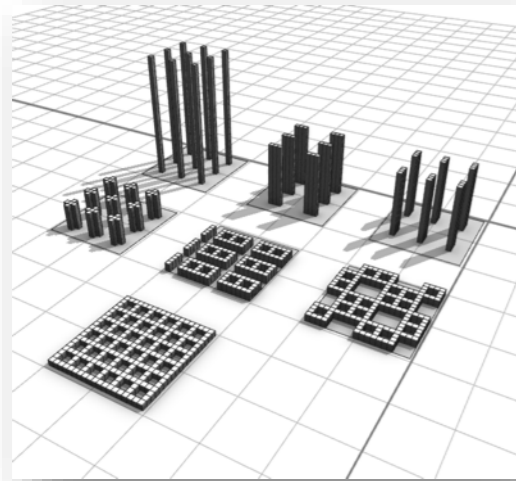
*Paramétrage interactif*



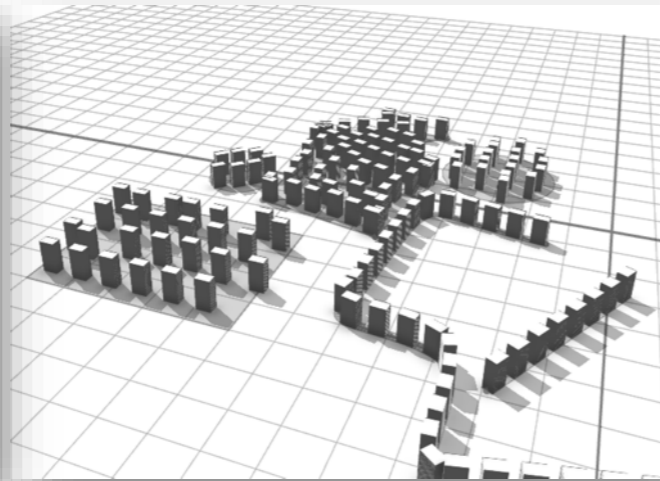
*Analyse interactive*



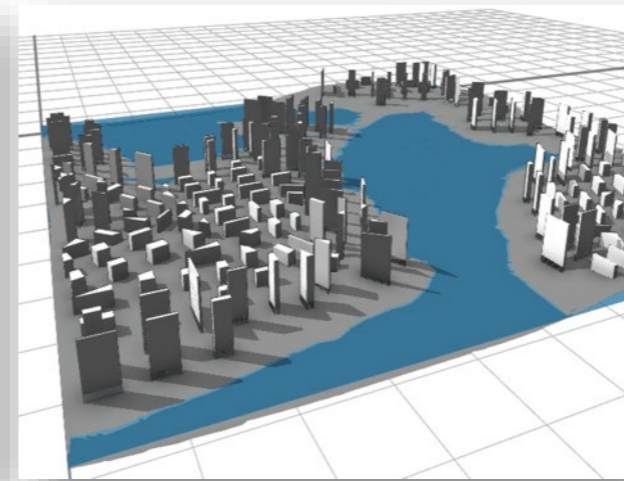
## Application: Urbanisme (examples)



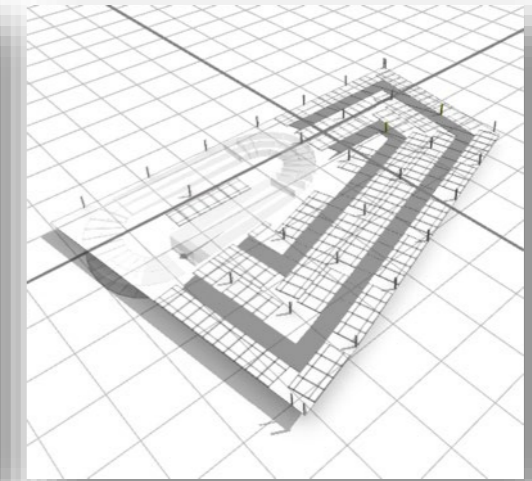
Densification



Distances de construction

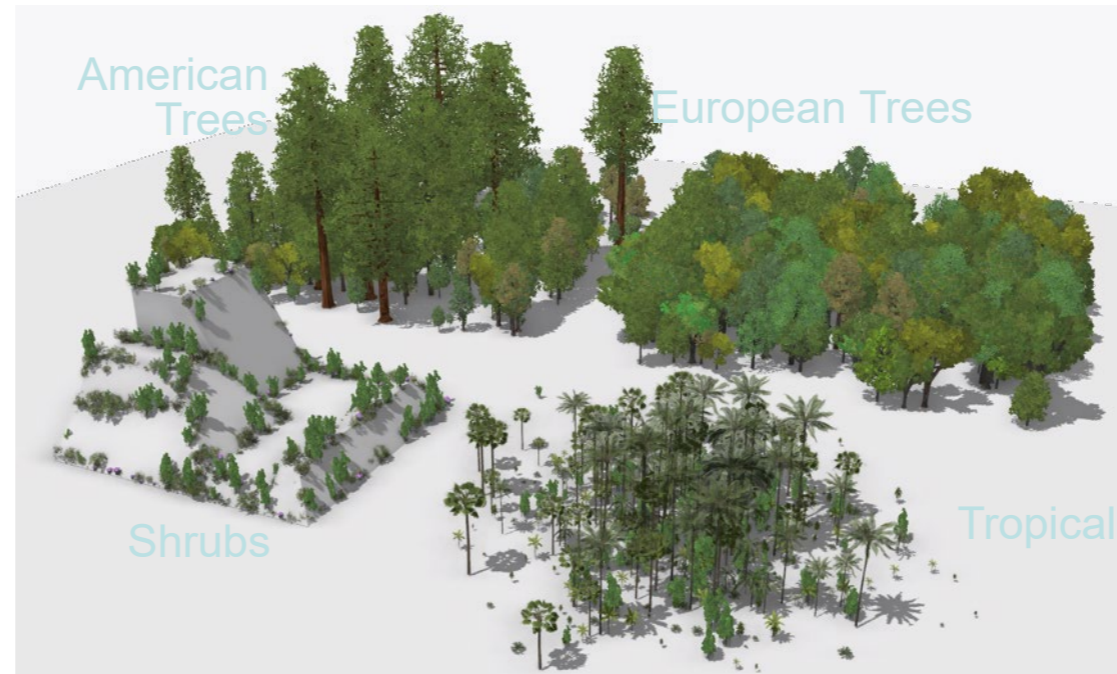
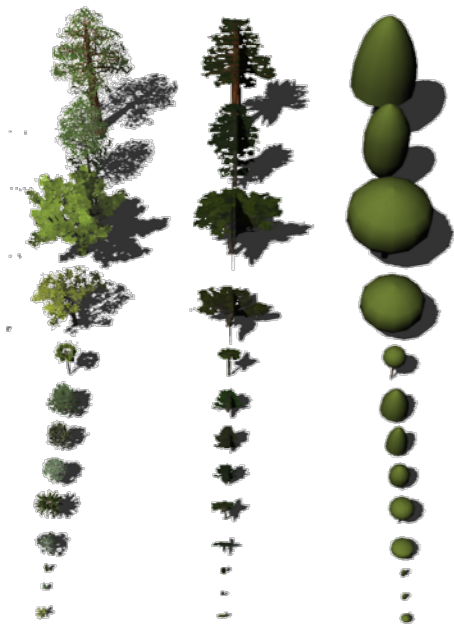


Niveau de l'eau

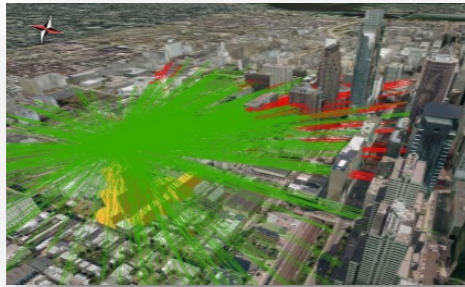


Places de parking

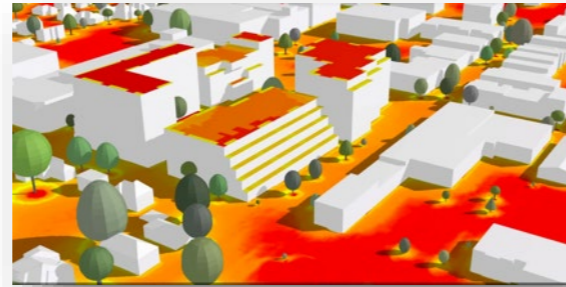
## Application: Végétation



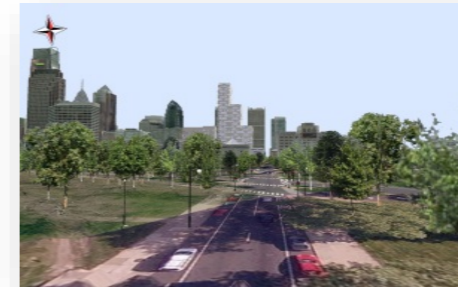
## Application: Analyse



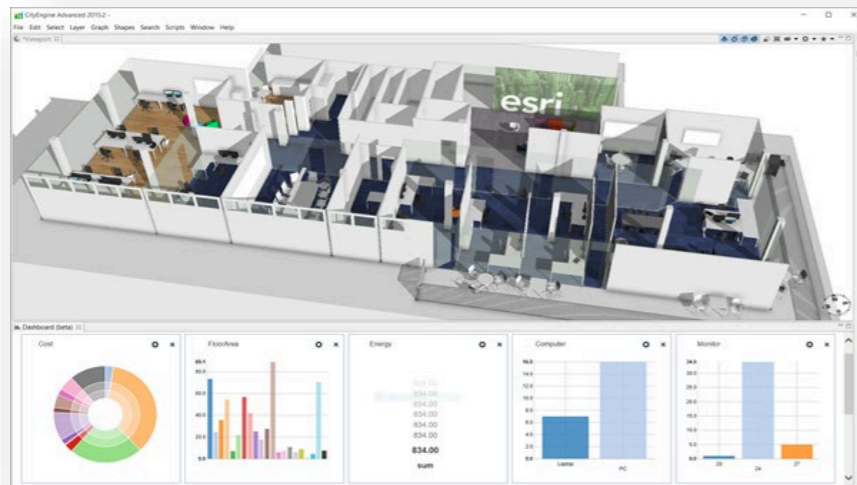
Visibilité



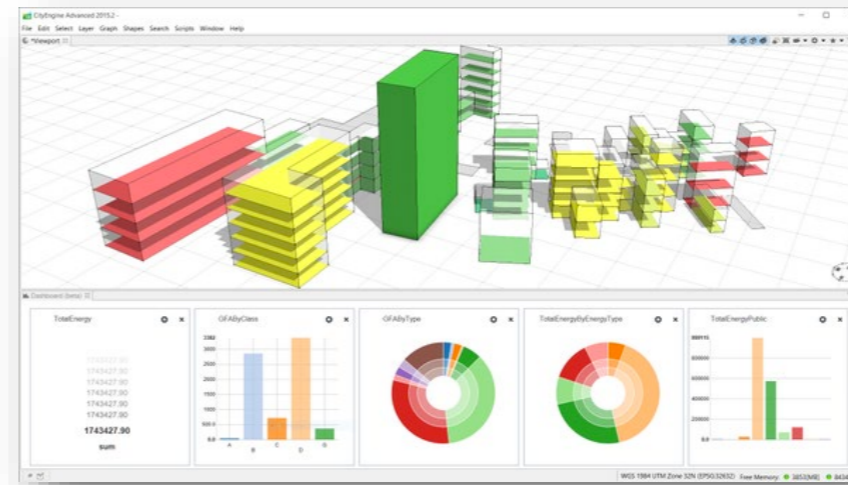
Rayonnement solaire



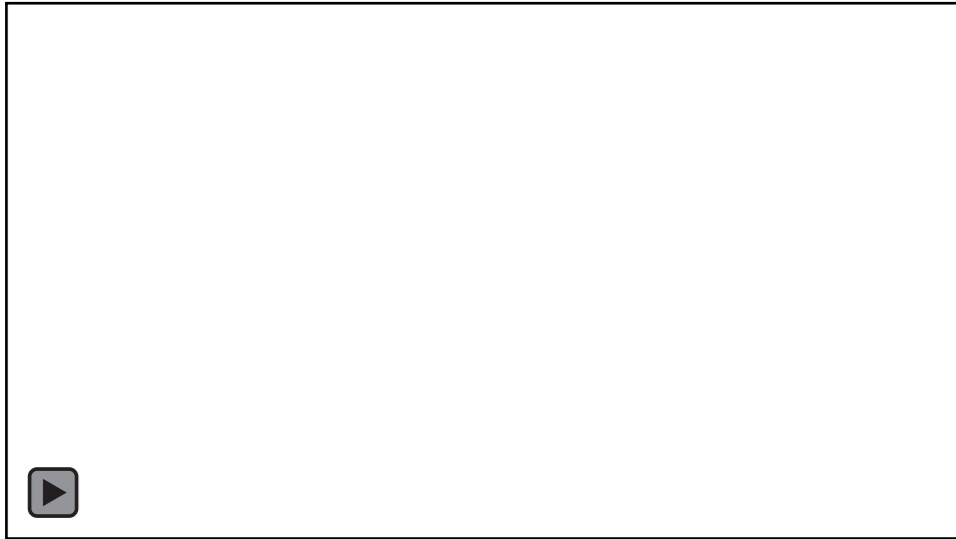
Visualisation de l'horizon



Scénarios / Chiffres clés



## Application: Réseaux de circulation



Design interactif



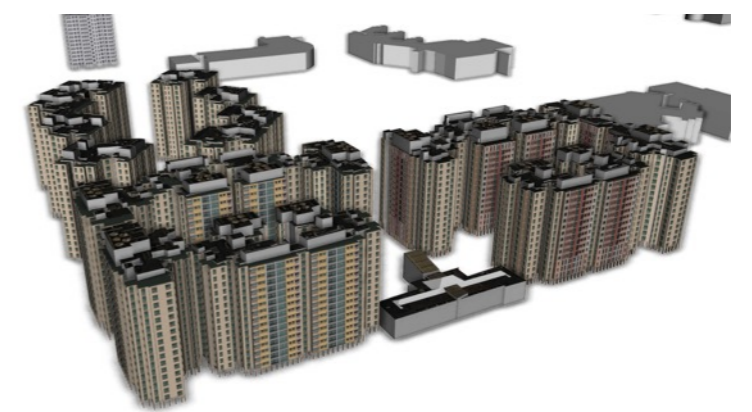
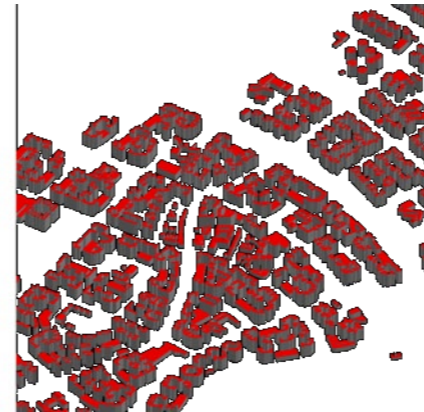
Analyse



Visualisation

## Application: Reconstruction (Virtual Singapore)

- Combinaison de vues aériennes + LiDAR
- Photogrammétrie
- Classification (ML)
- Identification de structure + extraction de paramètres
- Bibliothèque de façades + génération paramétrique
- Corrections manuelles



## Résumé

- La modélisation polygonale et la modélisation paramétrique se développent ensemble
- SIG + Règles
- Paramètres et chiffres clés
- Gain de temps grâce à la conception itérative
- Scénarios et comparaisons
  
- Avenir: optimisation automatique

