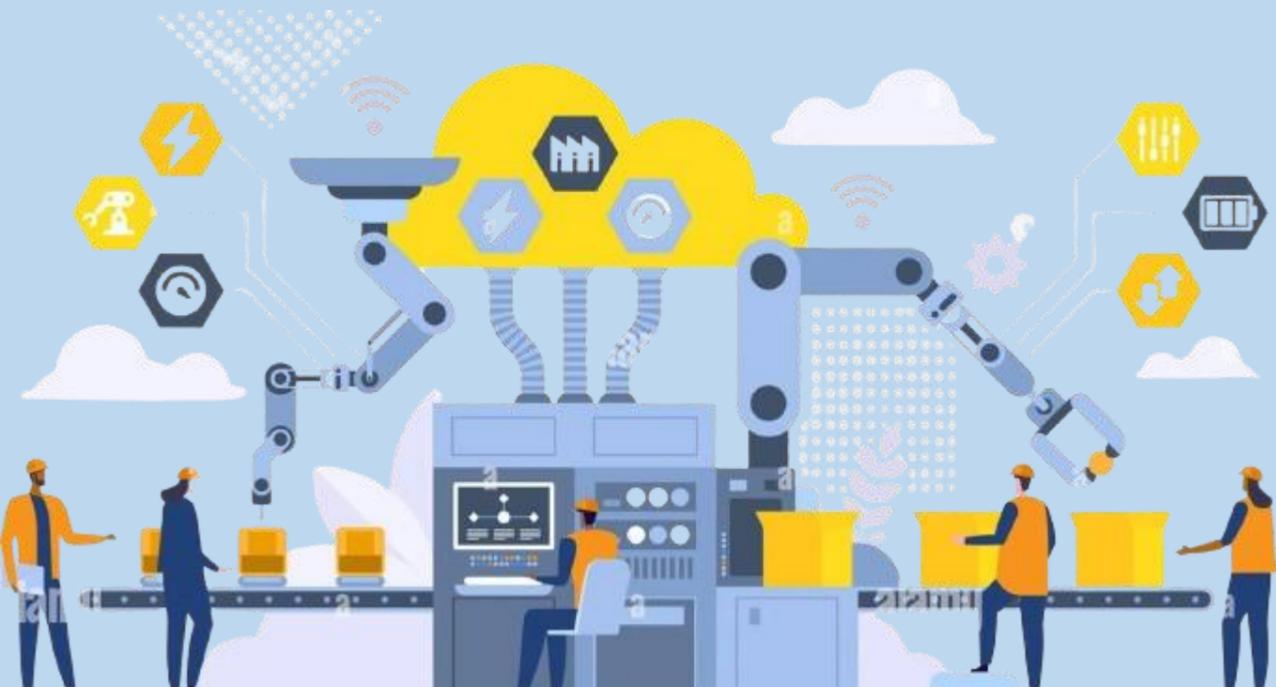


# Reconnaissance de l'activité humaine pour l'interaction humain-robot

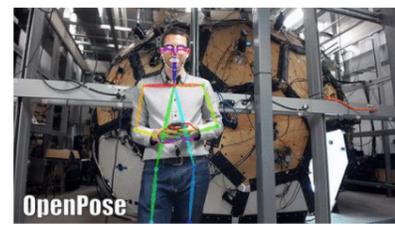
Projet HUMAR finance par Défi Clé "Robotique Centrée sur l'Humain"



- 📍 Sécurité
- 📍 Adaptation ergonomique
- 📍 Réalisation de la tâche en coopération humain-robot



## Détecteur de squelette depuis image



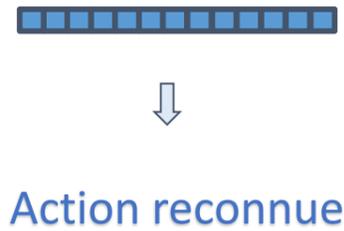
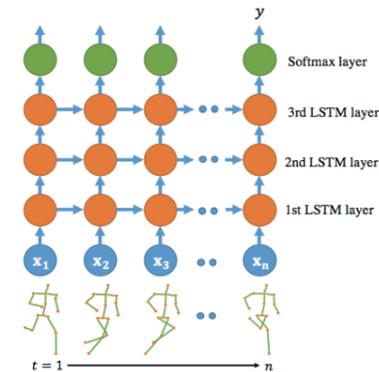
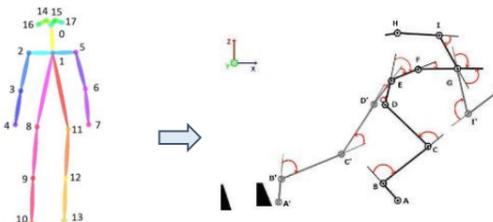
	Skeleton extractors	Identification	Multi-person detection	Foot keypoints	Hand keypoints	Facial keypoints	Easy C++ interfacing	Robustness with respect to motion	GPU integration	Framerate
Detectron2	Detectron2	×	✓	×	×	ears,eyes,nose	×	✓	✓	3.57 fps
MediaPipe	Mediapipe	✓	×	✓	✓	ears,eyes,nose,mouth	×	×	✓ on Linux	17 fps
YOLOv7	YOLOv7	×	✓	×	×	ears,eyes,nose	×	✓	✓	11.04 fps
AlphaPose	Alphapose	✓	✓	×	×	ears,eyes,nose,mouth	×	✓	✓	9.74 fps
Openpose	Openpose	×	✓	✓	✓	ears,eyes,nose,mouth	✓	✓	✓	9.91 fps

## Algorithm de reconstruction du squelette

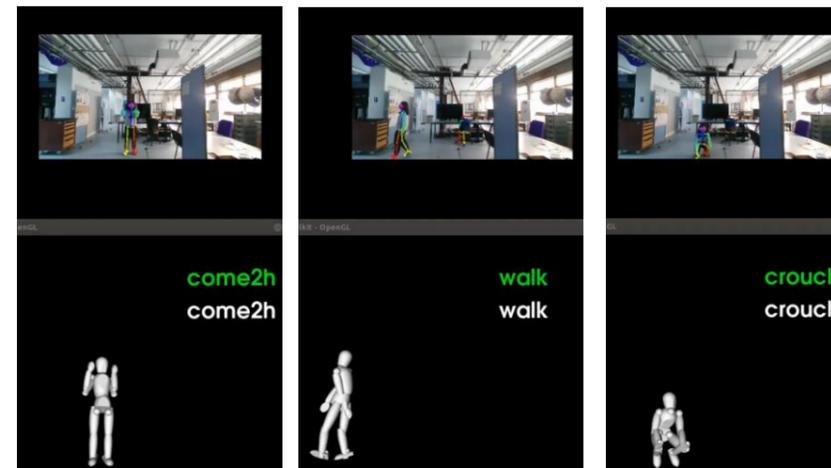
Optimisation par la cinématique inversée

$$*arg \min_{\dot{q}} \sum_{task_i} w_i ||J_i \dot{q} - K_i v_i||^2$$

where  $\dot{q}^- = \frac{q^- - q}{dt}$ ,  $\dot{q}^+ = \frac{q^+ - q}{dt}$ ,  $\dot{q}^- \leq \dot{q} \leq \dot{q}^+$



## Résultat



**Algorithm average precision:**  
**95% on testing data**  
**60,7% on arbitrary live video**  
 (amelioration en cours)

**Processing speed:**  
**~4 fps**