

GTC 2019

### VR/Immersive + Data Driven Decision Making

March 21, 2019

# vision - Do whatever it takes to lead

innovation in construction and manufacturing

**Mission** – To offer our construction and manufacturing customers interconnected productivity solutions that automate the creation, simulation and validation of their projects.



#### CMCORE COMPANY PROFILE CONSTRUCTION MANUFACTURING Automation Automation & **Robotics** В cloud productivity platform 3 Μ 4 9 SOFTWARE **3DEXPERIENCE** $\Xi \times \Xi$

- Team of ~90 engineers and software developers.
- Over 300 construction projects valued at >\$20B since 2014.
  - Virtual Construction, optioneering, digital fabrication automation
- Working in advanced manufacturing and software product development of the cmcore.io cloud productivity platform.
- Offices in Vancouver, Canada and Tokyo, Japan.



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## Use cases discussed in this presentation –

- 1. Driving real time decision making with as-built reality capture + VR on prefabricated mechanical room
- 2. Robotics 3D milling simulation, post processing and validation
- 3. Leveraging immersive digital twin of robot cells for macro process simulation
- 4. Rapid robot swept path programming with auto post processing to live robot
- 5. Real time optioneering of kinematic simulation for construction sequencing using production model, experienced in immersive environment
- 6. Data pipeline, computer vision and ML







VR Review of a Mechanical Room - Play

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VR Review of Robot Machining Sequence - Play

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VR Review of Computational Fluid Dynamic Simulation (Wind Study) - Play

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VR Review of Crane Movement & Connections - Play



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## **Data Strategy**: Train CMBeast neural net with simulation output and site recognition with computer vision and ML

**Input**: Output from construction/manufacturing simulation synthetic data

**Capture** synthetic images of structure being constructed with randomized camera positions and environment (lighting, weather, background, noise)

**Record** data about elements found in captured images

Developed **pipeline** generating 20,000 – 200,000 images a day, depending on resolution and complexity of the model

**Data preprocessing**: Parse through recorded data to extract what we want. Deploying data augmentation to overcome the gap between generated data that we used for training with real data we are gathering. Warping the lighting, colours and resolution to cover every edge case from real world.

**Training**: Image recognition and object detection neural network using captured images as inputs and the recorded live data as the labels

