Get Ready for Artificial Intelligence in Construction

Michael Moran
Founder/Consultant, Telos

Josh Kanner
Founder/CEO, Smartvid.io

Join the conversation #AULondon
Talk Outline

▪ What is AI anyways?
▪ What can AI do for construction:
  ▪ Smartvid.io (photo/video)
  ▪ BIM360 IQ (project data)
▪ What can we expect in the coming years?
Speakers

Michael Moran
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What is artificial intelligence anyways?
Computers until recently
Since an early flush of optimism in the 1950s, smaller subsets of artificial intelligence — first machine learning, then deep learning, a subset of machine learning — have created ever larger disruptions.
Deep Learning

Image Credit: amax.com
Computers today

Image Credit: Google
Impacting virtually every industry.
Parallel computing
Parallel computing
Better Algorithms

Image Credit: Google

Ever cleverer
Error rates on ImageNet Visual Recognition Challenge, %

Sources: ImageNet; Stanford Vision Lab
Economist.com
Lots More Data

90% of the world’s data was created in the last 2 years.

50x growth from 2010 to 2020.

We are here.

Image Credit: Familian
Construction Data Explosion

AI & Analytics

Structured data

Text

Images

Voice

Sensors/ IOT

Object level design data

Image Credit: Autodesk
An untapped resource

MEDIA FROM THE FIELD

The amount of pictures & videos captured every day in the field keeps getting bigger.

50 GB of data is generated on the typical project.

Much of it ends up unused, siloed across different systems and devices.
The Smartvid.io solution

OUR MISSION

@ SMARTVID.IO,

we're unlocking the value of photos and videos to dramatically improve safety, quality and productivity in the AEC industry.
How it works

SMARTVID.IO

PHOTO & VIDEO INTEGRATION

ADVANCED SPEECH & IMAGE RECOGNITION

WORKFLOWS, ANALYSIS & FEEDBACK

AUTODESK® BIM 360™
SMARTVID.IO IS FOR...

- **Everyone**
  - who wants to more easily search and find photo and video content in the company

- **IT Pros**
  - looking to leverage photos and videos across the company.

- **Safety Pros**
  - wanting to put in place a proactive safety program

- **Training Pros**
  - wanting to identify best practices and leverage them in the org

- **Operations Execs**
  - who want to get better productivity metrics on their projects for weekly job meetings

- **Marketing teams**
  - who need access to the latest project content and can’t get it from the OPS teams

- **Operations teams**
  - who want to give marketing a view into key imagery
**Basic: Object recognition**
- Is object present in image, Yes/No?
- Example: Is there scaffolding in this picture? (Yes/No)
- How used: image search within and across projects for key imagery (e.g., find me scaffolding images b/c I’m looking at a bill for scaffolding and want to check it)

**Advanced: Object analytics and logic**
- Where are the objects? How many of them are there? What is their volume? (Quantitative)
- Examples: Is each person wearing high vis safety gear? What is the location and volume of visual defects like cracks?
- How used: identifying and quantifying visual data
  - Safety (Hard hats, safety vests, more)
  - Quality (Cracks, more)
EXAMPLE: ADVANCED IMAGE RECOGNITION FINDS PEOPLE (1) THEN DETERMINES IF THEY ARE SAFE (2), THUS “FOCUSING” THE AI
SafetY In CoNStRuCtion

Why it matters

1 in 10 American workers are injured on the jobsite every year.

In a global industry, accidents cost 6-8%.

20% of all worker deaths occur in the construction industry.

Jobsite deaths have increased every year since 2007.
The results

**IMPACT**

<table>
<thead>
<tr>
<th>2016 Annual AI for Safety Photo Contest</th>
<th>Typical Construction Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong># REVIEWED</strong></td>
<td>1,080 photos</td>
</tr>
<tr>
<td><strong>HUMAN EXPERT TIME</strong></td>
<td>4.5 hours</td>
</tr>
<tr>
<td><strong>SMARTVID.IO TIME</strong></td>
<td>&lt;10 minutes</td>
</tr>
</tbody>
</table>
And deep learning for...

**SPEECH RECOGNITION**

- Industry keywords automatically detected from speech in video
- Tags are linked to timeline of video for instant retrieval and easy sharing or collaboration
- How used
  - Field worker narrates video using Smartvid.io app or native IOS or Android device
  - Office user (manager) can search by keyword
  - Example: see all installation of blocking, by location
WE’RE JUST GETTING STARTED

Smartvid.io for AEC

SAFETY

QUALITY

PRODUCTIVITY

Platform

ENTERPRISE ACCESS CONTROLS
DATA INTEGRATION & MANAGEMENT
MACHINE LEARNING ANALYTICS
WORKFLOW & REPORTING
Where things are going...

In this case, a worker's hard hat falls off.
THANK YOU!
AI/ML IS GETTING BETTER, FASTER THAN EVER

- Rapid advancements in deep learning frameworks – convolutional/deep neural networks are driving huge gains in performance
Skanska, CBT Architects Save $6M With First-In-New England Collaboration Method

Project team uses BIM 360 Project IQ software on Boston's only elliptical tower

May 8, 2017
Johanna Knapschaefer

Collaboration between CBT Architects and Skanska USA accelerated construction of an elliptical building that distinguishes itself in Boston's booming Seaport District.

As part of Autodesk's annual AEC Media Summit, Skanska hosted a panel discussion and site visit to the 121 Seaport building on May 4. Approximately 65% complete, the 17-floor, 400,000 sq-ft building that "trims 100,000 sq ft" is in Boston's Seaport District.

How construction companies are shaping the workflow software of the future

A look at Autodesk's Project IQ shows how machine learning could transform the building process.
Construction Daily Risk

1. Hundreds of subcontractors

2. Thousands of open issues

3. Daily change

4. Path to Efficiency

Image Credits: Autodesk
Categories

- **Water** - Risk of a water event (building enclosure, site drainage system, weather) that will result in damage to existing construction clean up effort

- **Key Activity** - Risk of impacting a key activity or milestone in a project that the project team committed to in their quality plan

- **Rework** - Risk of causing major rework above a set of financial or schedule limits to any party - owner, designer, contractor or trade

- **Inspection** - Risk of a failed inspection or test that was expected to pass
Project Team

BIM 360 IQ

United Construction
Bayfront Arena

Project Dates: Aug 16, 2016 – Jun 21, 2018

RISK SCORE

The risk score for this project is poor, and has been increasing over the past week.

SUBCONTRACTION RISK

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>CC Concrete</td>
<td>High</td>
</tr>
<tr>
<td>NorthStar Panels</td>
<td>High</td>
</tr>
<tr>
<td>Majestic Steel</td>
<td>Medium</td>
</tr>
<tr>
<td>Joe’s Plumbing</td>
<td>Medium</td>
</tr>
<tr>
<td>Rebar Masters</td>
<td>Low</td>
</tr>
</tbody>
</table>

HIGH RISK ISSUES

- **K2244 - Open penetrations in concrete.**
  - **To:** CC Concrete
  - **By:** Joe’s
  - Open penetrations in the concrete.渗透是开的，需要及时处理。

- **K22116 - The waterproofing barrier.**
  - **To:** NorthStar Panels
  - **By:** Joe’s
  - The waterproofing barrier installed does not meet the required standards. 防水层没有达到要求。

- **K22105 - The BIO’s installed.**
  - **To:** NorthStar Panels
  - **By:** Joe’s
  - The BIO’s installed require more documents. 需要更多的文件。

- **K22184 - The concrete tries.**
  - **To:** Majestic Steel
  - **By:** Joe’s
  - The concrete beam on the north side of the arena is to use closer spacing. 需要更紧密的间隔。

- **K22166 - Preparing incomplete at...**
  - **To:** Majestic Steel
  - **By:** Joe’s
  - Preparing incomplete at several locations. 需要完成。

Image Credit: Autodesk
Subcontractor