COGNITIVE MANUFACTURING

Session Chairs: Elizabeth Hoegeman
J. Rhett Mayor

Speakers: Dragan Djurdjanovic
Chris Will
Steve Ellet
Steven Skerlos
# Smartphone

<table>
<thead>
<tr>
<th>Processor</th>
<th>1.9GHz Quad Core (Snapdragon)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memory</td>
<td>32GB</td>
</tr>
<tr>
<td>Sensors</td>
<td>Microphone, Camera (2MP), Camera (13MP), accelerometer, barometer, 3-axis gyro, geomagnetic (digital compass), light sensor, proximity</td>
</tr>
</tbody>
</table>

iPhone 5
From: [www.apple.com](http://www.apple.com)

Nokia Lumia 1020
From: [www.windowsphone.com](http://www.windowsphone.com)

Samsung Galaxy S4
From: [www.samsung.com](http://www.samsung.com)
“Smartcar”

From: inhabitat.com, Marc Carter

From: www.edn.com

From: dc.streetsbolg.org, Anne Lutz Fernandez

http://www.centives.net/S/2012/what-effect-will-self-driving-cars-have-on-our-cities/
“Smart” manufacturing

• Manufacturing systems state of practice is “smart” – *intelligent* systems track production metrics and report to supervisory human operators via IT-enabled channels.
  – Decision making vests with the human operator
Cognitive Manufacturing

- Cognitive manufacturing is an evolutionary step in production system control that imbues the manufacturing system with capacity for perception, judgment and reasoning.
  - Cognitive manufacturing systems perceive changes and know how to respond
Cognitive Manufacturing

Market Objectives
- Sustainability: energy intensity reduction, CO$_2$ footprint, societal metrics

Production System Logistical Level
- Autonomous global logistics optimization (min. energy intensity, or capital intensity) through adaptation to supply variability and pricing volatility

Manufacturing System Level
- Factory-level manufacturing systems propagating autonomous operation towards market goals.
- AMES – perceive and respond to dynamics in local systems (environment, social) and interfaces with supply-chain
- Unstructured learning through peer to peer and experiential processes

Manufacturing Process Level
- Distributed COGNITIVE AGENTS embed cognitive capabilities in unit processes
- Perception imbued through ubiquitous sensing and sensor fusion.
- Reasoning imbued through *unstructured learning - Evolutionary techniques* experiential and swarm intelligence for adaptation and control.
Topic Areas

1. Distributed Agents for Artificial Immunity in Modern Manufacturing
   Dragan Djurdjanovic, University of Texas at Austin

   Chris Will, Apriso and FlexNet

3. The Rise of Computer-Enabled Supply Chain Design
   Steve Ellet, CHAINalytics

4. Cognitive Agents to Advance Sustainable Manufacturing
   Steven Skerlos, University of Michigan