McKinsey Global Institute predicts a nationwide shortage of 140,000 to 190,000 workers with “deep analytical skills,” and a deficit of 1.5 million managers capable of using big data analytics for actionable insights in their decision-making and predicts a 40 percent annual growth in global data and $300 billion in potential value-add of data analytics to the nation’s health care industry alone. Gartner Inc. indicates that by 2015, 4.4 million information technology jobs globally will be created to support data science and analytics, generating 1.9 million IT jobs in the U.S. The U.S. government anticipates a shortage of about 50,000 qualified workers in health IT between 2010 and 2015. Healthcare companies are increasingly borrowing technology specialists from other industries.

## Minor
Available to all CWRU undergraduate students

Essential elements of ADS includes Data Management, Distributed Computing, Informatics, Ontology, query, Statistical Analytics.

### Steps of Data Analysis:
1. Define ADS questions
2. Identify, locate, generate data
3. Exploratory data analysis
4. Statistical modeling and prediction
5. Synthesizing results
6. Creation of reproducible research

## Curriculum

### Level 1: Data Science Programming

### Level 2: Inferential Statistics

### Level 3: Exploratory Applied Data Science

### Level 4: Undergraduate Applied Data Science Research

### Level 5: Modeling & Prognostics

## Domain Areas

Domain areas available for minor concentration are:
- Engineering and Physical Sciences
  - Energy
  - Manufacturing
  - Astronomy
- Health
  - Translational
  - Clinical
- Business
  - Finance
  - Marketing
  - Economics

## Faculty

<table>
<thead>
<tr>
<th>Name</th>
<th>Dept./School</th>
<th>Domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roger French</td>
<td>EMSE/CSE</td>
<td>Energy/Man</td>
</tr>
<tr>
<td>GQ Zhang</td>
<td>EECS/CSE</td>
<td>En/Man/Health</td>
</tr>
<tr>
<td>Jim McGuffin-Cawley</td>
<td>EMSE/CSE</td>
<td>Man</td>
</tr>
<tr>
<td>Alexis Abramson</td>
<td>EMAE/CSE</td>
<td>Energy</td>
</tr>
<tr>
<td>Mark Chance</td>
<td>SysBio/SOM</td>
<td>Health</td>
</tr>
<tr>
<td>Colin Drummond</td>
<td>BME/CSE</td>
<td>Health</td>
</tr>
<tr>
<td>Jagdip Singh</td>
<td>Design &amp; Innovation/WSOM</td>
<td>Business</td>
</tr>
<tr>
<td>Robin Dubin</td>
<td>Economics/WSOM</td>
<td>Economics</td>
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<tr>
<td>William Mahnic</td>
<td>Finance/WSOM</td>
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</tr>
<tr>
<td>Jennifer Carter</td>
<td>EMSE/CSE</td>
<td>Manufacturing</td>
</tr>
<tr>
<td>Jenny Brynjarsdottir</td>
<td>Statistics/MAMS</td>
<td>CrossCutting</td>
</tr>
<tr>
<td>Gurkan Bebek</td>
<td>Nutrition/SOM</td>
<td>Health</td>
</tr>
</tbody>
</table>
Industry Engagement in CWRU ADS Minor

Energy/Manufacturing
- Eaton
- FirstEnergy
- GE
- Sherwin Williams
- Timken

Healthcare
- Accenture
- Cleveland Clinic
- Explorys
- GE
- KPMG LLP
- Medtronic
- Philips Healthcare
- Siemens
- University Hospitals
- IBM

Services
- Accenture
- GE
- Humana
- IBM
- Key Bank
- Medical Mutual of Ohio
- Teradata Corporation