Preparing the next generation for the cognitive era

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Abstract. After decades of data scarcity, we are finally arriving in the era of data abundance. Cognitive systems such as IBM's Watson, a cloud-based cognition service platform, can help us utilize all the data available to make better decisions in business, society, and our personal lives. But even with the help of cognitive assistants, data literacy will be a key new skill for students and professionals, as data transforms industries and occupations, and creates enormous entrepreneurial and startup opportunities. This brief paper highlights some current data-driven innovations.

Keywords: Big data, data science, data scientist, data engineering, data engineer, chief data officer, citizen analyst, data steward, data curator, careers, jobs

Innovation is accelerating and Data is at the core of this movement. Much of the hype has centered on how big data is and how fast it's growing. Both of which statements are absolutely true, in aggregate. Many disruptive solutions lever aggregation in creative ways. One of my favorite is Uber which is often hailed as a ride-sharing solution. I prefer to think of Uber as a data-driven car service which levers multiple data sources to disrupt the car-hire market. Uber is not only disrupting taxis and town car services, but rental cars, too.

Here is a short, and likely incomplete, list of the different types of data used by Uber.

- Digital Maps and cognitive routing: Google Waze is a common solution chosen by drivers.
- Location: Global Positioning System (GPS) sensors in your & your driver's phones.
- Images: Of the rider, the driver, the car.
- Driver Profile: Make of Car, License Plate, Name email address of rider, mobile phone.
- Rider Profile: Name, Email address, Cell Phone #, Credit Card(s).
- Reviews: Rider rates the driver, driver rates the rider.
- Route Taken: The exact path the driver took is recorded.

Uber puts all of this data to productive use. In most cities where I have used Uber I can request a car and will be on my way usually in less than five minutes. Sometimes it can be ten minutes. The driver knows exactly where I am, and I know where the driver is. I can call or text the driver if needed. I enter my exact destination into the App and off we go. Faster, easier, and cheaper than taxis. It's so easy, rental car business for travel use is declining. Bloomberg reported in April – "Rental car transactions have fallen fifteen percentage points in two years. The decline isn't quite as steep as the one experienced by taxies which fell twenty-three percentage points over the same period."[1]

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[1]O. Zaleski, Uber overtakes rental cars among business travelers, *Bloomberg Technology*, April 21, 2016, http://www.bloomberg.com/news/articles/2016-04-21/uber-overtakes-rental-cars-among-business-travelers (last checked June 20, 2016).

Uber is just one example of many innovations powered by creative use of ubiquitous data from multiple sources. Airbnb, LinkedIn, TripAdvisor, Uber, Watson, Weather Channel App, Yelp, Zazzle; the list is diverse and growing.

Sensors are a key driver of data-driven innovation. The iPhone 6[2] has an amazing array of sensors as follows:

- Front & rear Cameras;
- Multi-touch touchscreen display;
- Triple microphone;
- GPS;
- Apple M8 motion coprocessor;
- 3-axis gyroscope;
- 3-axis accelerometer;
- Digital compass;
- iBeacon;
- Proximity sensor;
- Ambient light sensor;
- Touch ID fingerprint reader;
- Barometer.

The latest automobiles have many new sensors as well. The sensors are no longer just limited to speed or oil pressure. The latest cars have cameras, radar, ultrasonic sensors, etc. These are used to provide adaptive cruise control, lane departure warnings, blind spot detection, and the list goes on and on. Smart cities use sensors aggressively to better understand the community and provide value. Noisy parties, gunshots, water quality, air quality, traffic, transit, weather; anything that can be sensed and measured is. Sensors are driving an exciting new area of innovation called the Internet of Things.[3] Indeed, the number of sensor is increasing. In 2013 it was estimated that there were between seven to ten billion sensors in place with the projections for the year 2020 at between twenty-six to thirty billion sensors – an annual growth of fifteen to twenty percent![4]

Data is all around us. It is driving innovation. It is impacting everyone's lives. Taking full advantage of data requires new skills and competencies. New data specialist career paths have already emerged. The data scientist, the citizen analyst, the data engineer are three we read about regularly. An argument can be made that data is changing every career, every field of study. The big data and analytics talent discussion has largely focused on a single role – the data scientist. However, the need is much broader than data scientists. Data has become a strategic business asset and every professional occupation must adapt to this new mindset. Universities in partnership with industry must move quickly to ensure that the graduates they produce have the required skills for the age of big data. Existing curricula should be reviewed and adapted to ensure relevance. New curricula and degree programs are needed to meet the needs of industry.

To take full advantage of data in today's Cognitive Era, everyone needs to become data literate. What is data literacy? IBM in partnership with Oceans of Data pulled together an expert panel who arrived at this short list of competencies:

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[2]Wikipedia, iPhone 6, https://en.wikipedia.org/wiki/IPhone_6.

[3]Wikipedia, Internet of things, https://en.wikipedia.org/wiki/Internet_of_things (last checked June 20, 2016).

[4]H. Bauer, M. Patel and J. Veira, The Internet of things: Sizing-up the opportunity, *McKinsey*, http://www.mckinsey.com/industries/high-tech/our-insights/the-internet-of-things-sizing-up-the-opportunity (last checked June 20, 2016).

- *Define problems*;
- *Wrangle Data*;
- *Self-Manage Data*;
- *Choose Methods and Tools*;
- *Analyze Data*;
- *Communicate findings*;
- *Engage in Lifelong Learning*.

To learn more about data literacy, please read the IBM report that can be downloaded from the Oceans of Data website: http://www.oceansofdata.org/new-report-data-literacy.

About the author

Steven Miller leads academic programs for IBM Analytics Group. His primary focus is collaborating with universities to build the pipeline of talent needed by the data driven organization. Mr. Miller's work spans data and analytics literacy for every student to emerging specialist roles such as the data scientist and data engineer. Mr. Miller joined IBM in 2001 as part of the acquisition of Informix Software, a leading provider of mission critical database systems. Since joining IBM he has held multiple roles in product management, product marketing and business & go-to-market strategy.