



Designing and Delivering with Data

Webinar

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James Lea

- ▶ BA Hons Physics; MSc Sat Comms Engineering
- ▶ Project and programme delivery 20+ years
 - ▶ Digital
 - ▶ Construction
 - ▶ Procurement
- ▶ FAPM, FBCS, CITP
- ▶ Advocate of data-driven complex change delivery
- ▶ Founder of Project Science Ltd
- ▶ Amateur Astronomer
- ▶ Professional Observer and Leader of Change



A Universe of Data

Galactic Center, composite (NASA/JPL-Caltech/ESA/CXC/STScI)



Milky Way, 100 billion+ stars

Amateur Astronomy

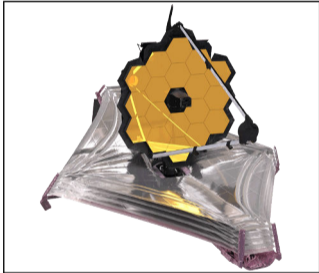


6" Ritchey-Chrétien scope
HEQ5 equatorial mount
ZWO 585MC CMOS sensor



Jupiter
Credit: James Lea

Professional Astronomy



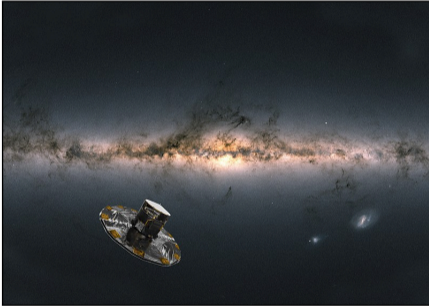
James Webb Space Telescope



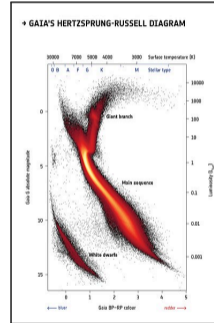
Carina Nebula (first images in infra-red)

Credits: NASA, ESA, CSA, and STScI

Data to Insights



Gaia mapping positions of 100B+ stars.



Hertzsprung-Russell diagram
Credits: NASA, ESA, CSA, and STScI

Stellar Evolution vs Project Evolution

1. Stars evolve through a lifecycle¹
2. .. so do projects
3. We can make (testable) predictions on stellar evolution, using our knowledge of physics, astronomy and mathematics
4. .. but do we make reliable predictions on **project evolution**?

¹<https://universe.nasa.gov/stars/basics/>

Thinking like a Scientist

Generating reliable (testable) predictions on project evolution is hard because:

1. The core science is still being developed
2. We don't "write up" and publish our projects - "commercially sensitive"
3. We think that all projects are unique - "apples versus oranges"
4. Our *project universe* contains people
5. Few stakeholders have skin in the game - "it's not my money"

How can we get better at predicting project outcomes?

Improving Project Success Rates

We need to do five things:

1. Choose our **lens** to observe effectively
2. Understand the **art of the possible**
3. Exploit **high-value prediction techniques** and build the science
4. Make data work for everyone: **social, psychological and cultural**
5. Deploy, improve our predictions and **realise the benefits**

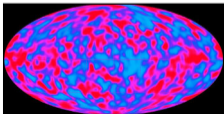
Lens

Can we work out how the universe functions using this?



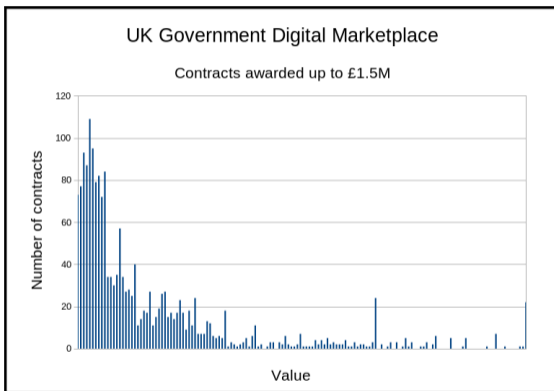
Hubble; Sirius A; image credit: ESA/NASA

Or is this more helpful?



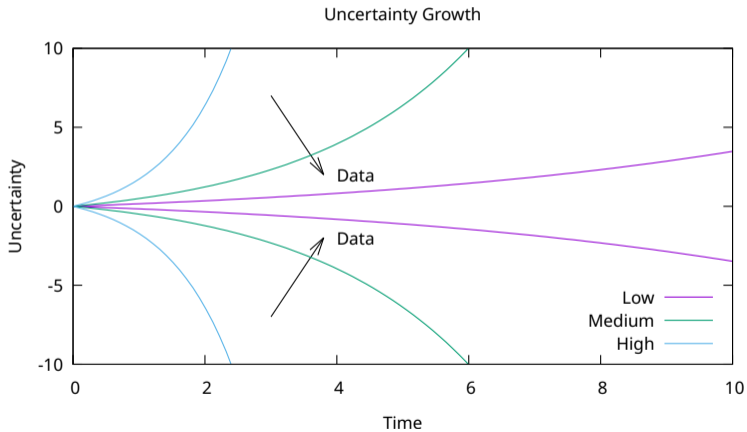
COBE cosmic microwave background
(density) variations; image credit: NASA

Take the Ensemble View



Prepared by Project Science Ltd

Embracing Uncertainty



The Art of the Possible

Three trends:

- ▶ Big data that can be used to make predictions has grown exponentially
- ▶ Tools can 'learn' across large data sets and generate actionable insights
- ▶ Move from descriptive to predictive and prescriptive analytics

Reducing Uncertainty with Data

- ▶ Duration
- ▶ Effort and Storypoints
- ▶ Resources
- ▶ Burndown and Velocity
- ▶ Cost
- ▶ Schedule quality
- ▶ Risks and Opportunities
- ▶ Earned Value Management (CPI, SPI)
- ▶ Sentiment
- ▶ Feelings
- ▶ Networks
- ▶ Perceptions
- ▶ Wellbeing
- ▶ Waste and rework
- ▶ Interruptions / meeting time
- ▶ Complexity

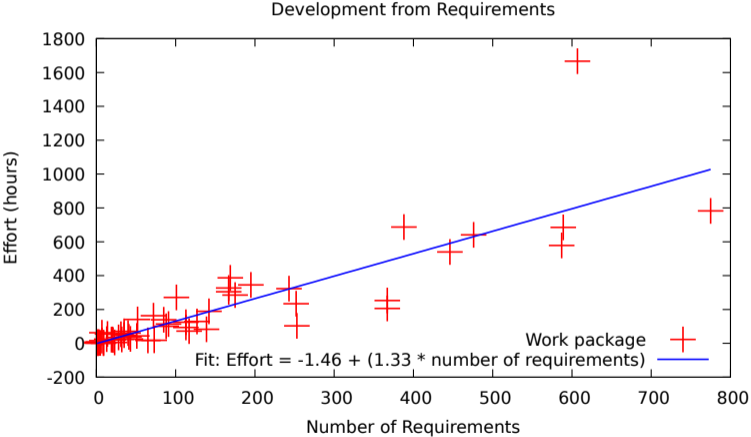
Building prediction models

Designing with Data:



- ▶ Establish what you can measure, and how those measurements correlate with outcomes
- ▶ Choose a **type** of model that supports your needs
- ▶ **Train** the model using the data
- ▶ Test the predictions

A Prediction Model



High-Value Prediction Techniques

Machine Learning ("AI")

▶ Supervised

▶ Regression

- ▶ Linear Regression
- ▶ Decision Trees
- ▶ Artificial Neural Networks

▶ Classification

- ▶ Naive Bayes
- ▶ Nearest Neighbour
- ▶ Support Vector Machines

▶ Unsupervised

▶ Clustering

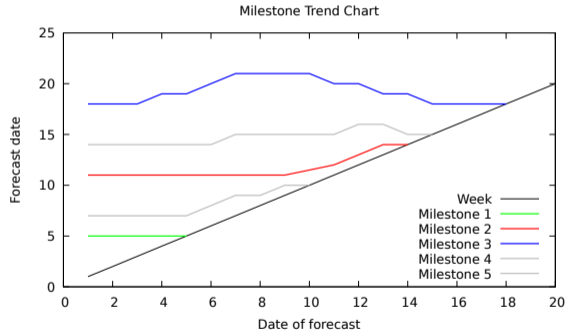
- ▶ Hierarchical
- ▶ K-Means
- ▶ Hidden Markov Model
- ▶ Hierarchical
- ▶ Artificial Neural Networks

Digital Twins



Convergence: digital representation of the world; **modelling reality.**

When will we arrive?



Mentimeter Question



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Q1 – I understand the range of capabilities that project data science can provide

Making data work for everyone



Data - A Team Sport!

Enabling Efficiency

- ▶ Business (or sometimes Robotic) Process Automation
 - ▶ Voice recognition and captioning
 - ▶ Meeting transcriptions
 - ▶ Automated action taking
 - ▶ Chatbots
 - ▶ Reporting
 - ▶ Scheduling
 - ▶ Recommendation and Decision engines

Beneficial Feedback Loops

- ▶ The **magic begins** when organisations and teams see the connection between data and performance.
- ▶ Data is **not for reporting**, but for those closest to the action who stand the best chance of making improvements.
- ▶ Design measures that work for your team - **value-pull**.

Estimating and the Emotional Response

- ▶ Create safe spaces for project data science
- ▶ Discover and trust the "laws of motion"
- ▶ Acknowledge and quantify uncertainty
- ▶ Accept change (anti-fragile)
- ▶ Communicate
- ▶ Celebrate!

Fear, Apprehension, Surprise \Rightarrow Trust, Anticipation, Acceptance.

Mentimeter Question



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Q2 – I understand how I can use project data science to improve project outcomes

Realising the Benefits

Data culture and capabilities at all levels:

- ▶ Government
- ▶ Clients
- ▶ Regulators
- ▶ Shareholders
- ▶ Board CIO/CTO
- ▶ Projects, Programmes, Portfolios
- ▶ Data Scientists, Data Engineers
- ▶ End users and Customers

Summary

Choose our lens	Empirical science
Understand the art of the possible	Predict all delivery factors
Exploit high-value prediction techniques	Understand what can be achieved
Social, psychological and cultural aspects	Make Data A Team Sport; value the insights
Deploy, improve our predictions and realise the benefits	Drive continuous improvement everywhere

Mentimeter Question



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Q3 – I'm confident that we can deploy these techniques in our organisation

Imagine If..

Charles Messier



"Messier Catalogue" 103 astronomical objects: 1781

.. we had a **Project Catalogue?**

Thank You



Let's collaborate:

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