



Decisions with confidence: Applied statistics in Shell

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Questions

You

- Shell does statistics?
- Links with STOR-i?
- Life in industry?

Shell

- Who are we?
- What we do?
- What we say?



The team

- Team consists of 18 people working in three countries
 - UK (Chester), NL (Amsterdam / den Haag), USA (Houston)
- Inter-disciplinary
 - Stats, Maths, Physics, Chemistry, ChemEng and MatSci
- Different perspectives
 - 9 nationalities, age of members $\in [24, 58]$



Career

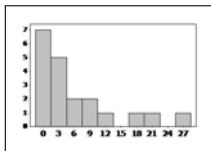
Qualifications

- MSc/PhD Stats
- MSc Pharma
- MSc Econometrics
- PhD Eng
- PhD Physics
- PhD ChemEng
- PhD MatSci
- PhD Chemistry

Before Shell

- Pricing Consultant
- Business Consultant
- Lecturer
- Engineer
- Chemicals
- MetOcean
- Reliability
- Analytical Chemistry
- Lubricants
- Control

Years In Stats



- Some pass through
- Others stay

Now

- Loyalty
- Climate Change
- Lecturer
- Banking Statistics
- Control Engineer
- Risk Manager
- Retail
- Reliability
- Automation
- HR

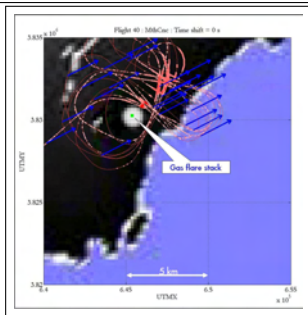
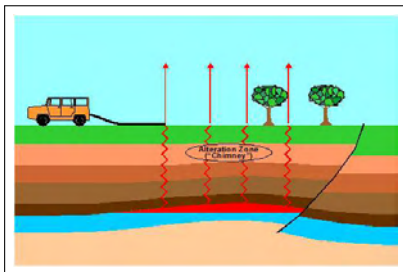
How we help

- Data, beliefs, facilitation
- \Rightarrow Information and rational learning
- \Rightarrow Better decisions

- **Impact** on organisations from shop floor to boardroom
- Solution **mix** of R&D, consultancy, software, training
- Solution **integration** within existing systems

- Exploration (remote sensing, structural design)
- Production and manufacturing (monitoring, inspection, product quality)
- Product development and marketing (design and analysis of experiments)
- Environmental modelling (spatio-temporal)
- Business modelling (econometrics, forecasting, carbon abatement)

Remote sensing



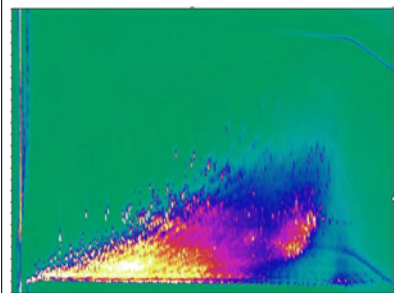
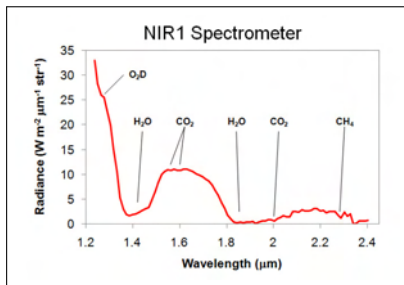
• Inversion

- Sparse sources, high-dimensional
- Measurement process
- Dispersion / wind fields
- Uncertainty ...

• Multiple sensor technologies

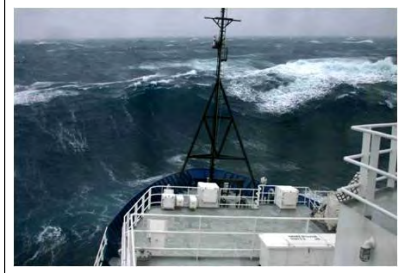
- Bayesian approaches (BL, MCMC, ...)

Chemometrics



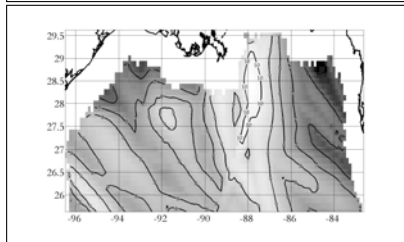
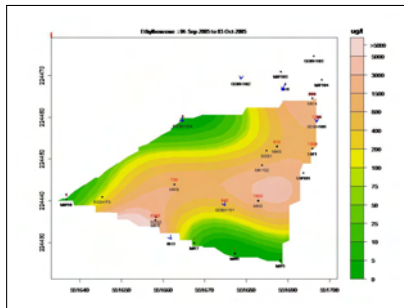
- Calibration
 - Spectroscopic data
 - Prediction of product properties
- Process monitoring
 - Continuous and batch processes
 - Risk assessment

Structural design



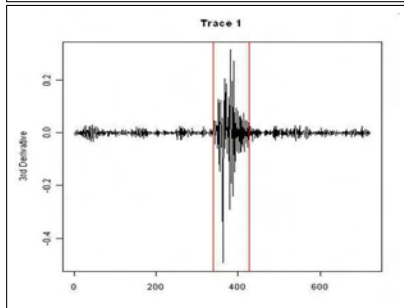
- Extreme environments (waves, corrosion, fouling)
 - Covariates and dependence
- Asset integrity
 - Inspection and maintenance optimisation
 - Risk assessment

Environment



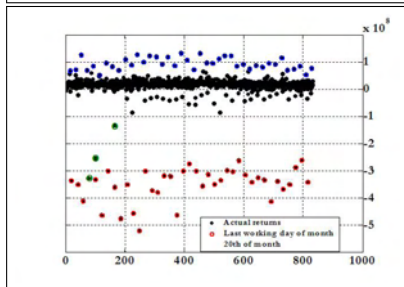
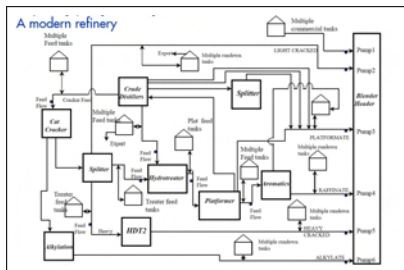
- 2- and 3-D spatio-temporal modelling
 - Splines, random fields
 - Extremes
- Software development
 - R-panel
 - MATLAB suites

Product development



- Design and analysis of experiments
 - Chemicals, fuels, lubricants
 - Quantification of benefit
- New products
 - Biofuel
 - C-FIX
 - Cement
 - ...

Business modelling



- Carbon abatement modelling
 - OR - feasible operating regime for refinery
- Time-series modelling
 - Empirical models ("non-conventional")
 - Multiple (> 1000) time-series sources
 - Model quality and validation
- Software development
 - Integration in "live" financial systems

Is this for me?

What statisticians in Shell say

- Breadth: requirement to apply statistics in many fields of activity
- Impact: statistics provides a real impact - changes the way people do things and think about things
- Innovation: develop new approaches (with academia, or in house)
- Colleagues: working in a team of statisticians and colleagues from other disciplines



Academic links

- Delft (Corrosion)
 - Durham (Bayes linear for inspection design, inversion, emulation)
 - Glasgow (Spatio-temporal modelling, visualisation)
 - Lancaster (Extremes, wavelets for change point analysis)
 - MIT (Inversion for remote sensing, random field models)
-
- PhD sponsorship (for students and staff)
 - Internships
 - Summer placements

The role of applied statistics - essential to society

Quantifying and understanding uncertainty, and informing decisions subject to uncertainty

- National statistics and government policy
- Medical, Scientific and Engineering progress
- Education / Academia
- Finance, commerce and manufacturing industries

Thanks for listening
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