Maths saves lives
Operational research for healthcare

School of Mathematics
Vince Knight
Data

<table>
<thead>
<tr>
<th></th>
<th>Sex</th>
<th>Height</th>
<th>Weight</th>
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<tbody>
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<td>M</td>
<td>187.306088</td>
<td>72.233276</td>
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<tr>
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```python
>>> import scipy.stats

>>> ttest = scipy.stats.ttest_ind(
...     df[df['Sex']=='M']['Height'],
...     df[df['Sex']=='F']['Height'])

>>> ttest.pvalue
0.070033630470421021
```
Examples
(Geraint Palmer)
## Optimisation

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<th>9</th>
<th>10</th>
<th>11</th>
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**Full Time**

- £7.50 per hour
- 4hrs, 1hr break, 3hrs

**Part Time**

- £8 per hour
- 4hrs
Optimisation

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**Full Time**

- 3
- £7.50 per hour
- 4hrs, 1hr break, 3hrs

**Part Time**

- 12
- £8 per hour
- 4hrs
Queueing Theory

every time unit → □□□□□ → every time unit
Realistic (stochastic) queue

Time units: 0 20 40 60 80 100

Total time: 0
Service time: 250 500 750 1000 1250 1500 1750

Total time: 100
Service time: 20 40 60 80 100
Dynamical Systems

Susceptible → Infectious → Infected → Recovered

Infectious rate

Recovery rate
Game Theory

Hospital 1

≥ $K_1$?

Divert

Hospital 2

≥ $K_2$?

Divert
Partnerships
Welsh Ambulance Service Trust
Ambulance allocation for maximal survival with heterogeneous outcome measures V.A. Knight, P.R. Harper, L. Smith (2012) \textit{Omega}
University Hospital of Wales (UHW)
How efficient can an emergency unit be? A perfect world model. Kesh Baboolal, Jeff D Griffiths, Vincent A Knight, Andrew V Nelson, Cheryl Voake, Janet E Williams (2012) EMJ
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