Geometric Quantisation

Benjamin C. W. Brown
B.Brown@ed.ac.uk

Women in STEM Society Talk

~

9th February 2021

Some Physics

Classical Mechanics

- In classical mechanics, the space of all possible states of a system is given by *phase space*, M.
- "*State*" describes the *position* and the *momentum*.

Quantum Mechanics

- In quantum mechanics, still have phase space M but states are replaced by *wavefunctions*.
- In my research, wavefunctions are just *homogeneous polynomials*, for example:

$$\phi(\mathbf{z}) = z_1^{k_1} z_2^{k_2} z_3^{k_3}, \qquad \text{where } k_1 + k_2 + k_3 = k.$$

Lattice Points

- Certain type of spaces M are special: each has an associated polytope.
- Each lattice point inscribed inside correspond to a polynomial.

Quantisation Dimension

- Dimension of the quantisation for each M is equal to the lattice point count.

Half-Spaces

- Each polytope can be thought of as the intersection of half-spaces.

Hyperplane Arrangements

- What if we included both sides of the hyperplane?
- Get something unbounded.

Quantisation?

- Previous argument tells us the respective quantisation is infinite-dimensional.
- So I am trying to break the arrangement into manageable pieces, each a with finite-dimensional quantisation.

A-Levels & Undergraduate

A-Levels

- During my A-Levels, I originally wanted to study chemistry.
- Decided that Physics and Further Maths would be beneficial for this.

Undergraduate Studies

- Eventually studied integrated Masters in Mathematics & Physics at The University of Warwick.
- In my 2nd Year, became interested in geometry because of its deep relationship with physics.

Postgraduate Studies

- Wasn't successful in my first round of PhD applcations.
- Stayed at Warwick for a MASt in Mathematics, to strengthen my mathematics.
- Received an unconditional offer for Edinburgh 😇.