Abstract: There exist as many proofs of the Pythagorean Theorem as there do courses in the average math department. But how many of these proofs offer a unique perspective on the theorem and how many are repackaged forms of a single, fundamental idea? By creating and refining the web of connections between mathematical ideas, researchers are able to exploit the web to solve new problems. Today we go hunting for connections between two important ideas in the study of Legendrian knots.

A Legendrian knot in 3-dimensional Euclidean space is a smooth knot obeying a set of extra geometric conditions that limit our ability to stretch and move the knot. The extra conditions refine smooth knot theory so that, for example, there exist infinitely many Legendrian unknots that can not be deformed into each other without breaking our geometric conditions.

We will define two differential graded algebras central to the study of Legendrian knots. One is geometrically motivated by classical Morse Theory and the other by the more modern Floer Theory. On the surface, the foundations of these invariants appear very different. However, recent results suggest deep connections exist between these two algebras. This work is joint with Dan Rutherford.