On the hunt for dark matter

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New University of Adelaide Future Fellow Dr Martin White is starting a research project that has the potential to redirect the experiments of thousands of physicists around the world who are trying to identify the nature of dark matter.

Dr White is developing new computational (data mining) techniques that will allow him to analyse an extensive range of particle physics and astrophysics data from global experiments and test the various models of dark matter.

"If you put together everything we know about the Universe, only about 4% is normal matter – the rest is dark matter and dark energy," says Dr White. "Following the discovery of the Higgs Boson two years ago, dark matter remains the biggest problem in fundamental physics.

"Tens of thousands of physicists around the world are working on it. Until we understand the nature of dark matter, we simply can't understand a huge amount of our Universe."

Dr White will be developing a giant software package to take in the massive amounts of data from different experimental sources including from the Large Hadron Collider, in order to test the viability of a wide class of theories.

The results will then help design the next generation of dark matter searches in gamma ray and neutrino astronomy.

"We think dark matter is some kind of new particle that hasn't been identified," says Dr White.

"As far as we know there is a theory of particles that explains dark matter. By putting all of this data together we should be able to work out what that theory is.

"To be able to do that, however, we need very complicated data mining techniques – new ways of analysing the data from the results of many large experiments.

"Some of the theories of dark matter have been tested with a few bits of data. But no-one has taken all the data and attacked all of the ideas to see which ones stand up."

Dr White is one of the University of Adelaide's 11 new Australian Research Council Future Fellows. This project will run over four years. "At the end of the project we aim to have the world's most advanced computer program telling us which theory of dark matter is true," says Dr White

"I hope by then we will also have seen measurements to support the theory – the first indications of dark matter in the Large Hadron Collider or in other experiments."

Provided by University of Adelaide

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