# A novel machine-learning algorithm for uncovering brain connections underlying autism

Many machine-learning algorithms aim to use data to find the underlying connections between different regions. For example, there has been great interest in using recordings from functional Magnetic Resonance Imaging (fMRI) to map the interactions between areas of the brain. The resulting maps, or connectomes, have several potential uses, such as understanding the characteristics of brains with and without clinical disorders (*e.g*. autism). With advancements in fMRI techniques, brain recordings are increasingly detailed, creating a need for novel algorithms to extract connectomes from complicated data. This study's main contribution is the formulation of a novel algorithm, named WELM, to robustly calculate connectomes from fMRI recordings. WELM mathematically combines three recent statistical components: imposing sparsity (not including too many connections), enforcing a prior (preferring short connections), and multi-task learning (calculating the differences between an autism group and a control group). To evaluate WELM, this study examines an fMRI dataset comprising of roughly 1,000 subjects, half of which have autism. WELM significantly outperforms all state-of-the-art algorithms on this dataset, yielding novel insights regarding the neural basis of autism. WELM’s success and flexibility demonstrate potential for future applications to other neurological disorders (*e.g.* Alzheimer’s, PTSD) and problems that require estimating connectivity between regions (*e.g.* gene networks, natural language processing).