Project proposal

Project title	To develop an Artificial Intelligence method, utilising MatlabTM Neural Networks (ANN) modelling, of predicting the load capacity and settlement behaviour of pile foundations
First Supervisor	Dr ⌄ Joshua Omer
Second Supervisor	tbc
School	Civil Engineering and Construction ⌄
Other member of supervisory team (no more than three KU supervisors in total)	
Specific requirements beyond 2:1 degree	

Project summary
(max 4,000 characters)

MSc by Research

It is proposed to develop an Artificial Intelligence method, utilising MatlabTM Neural Networks (ANN) modelling, of predicting the load capacity and settlement behaviour of pile foundations commonly used in the UK.

OBJECTIVES

(a) extend the existing database of pile behaviour to include all salient varieties of UK soils and weathered rocks, using publicly available data and information held by collaborating establishments (Federation of UK piling contractors and The Building Research Establishment)

(b) benchmark the applicability of the existing design methods to the database,

(c) identify and quantify the factors affecting pilesoil load transfer in order to enable engineers to avoid the need for expensive instrumentation and load testing of piles,

(d) develop neural network and finite element models to provide accurate prediction methods for load capacity and load settlement behaviour of different pile types installed in various UK ground conditions. This will help curtail unnecessary costs arising from overdesign of piles as a result of conservative estimation of settlement.

METHODOLOGY AND ANTICIPATED OUTCOMES

An extensive database of at least 2,000 case records will be developed, for ANN modelling, from high quality pile tests in which shaft and base capacities have been measured separately. The database will include details of the soil properties in terms of the most reliable insitu tests, including Cone Penetration Tests (CPT) and Standard Penetration Tests (SPT). Soil parameters determined from CPT and SPT data will be investigated in parallel as input information for ANN modelling.

If successful, the project has the following potential impacts:

(a) establish a basis for reviewing the Eurocode7 guidelines for pile foundation design

(b) curtail unnecessary costs caused by overconservative design of piles hence increase the safety and economy in construction

(c) allow assessment of bearing capacity of pile foundations more reliably than is presently possible

(d) assist engineers reduce the need for field testing of foundations hence reduce construction time

(e) Increase understanding of the loaded response of pile foundations in various soil conditions