When making choices people often strive for various objectives (e.g., want to buy a good quality product and to pay little at the same time), i.e., they use different criteria. Decision alternatives which are good with respect to some criteria may be unattractive regarding other, thus making a choice requires (more or less conscious) deciding on the importance of criteria at hand. Determining the relative importance of criteria precisely (e.g., determining one's willingness-to-pay, WTP, for a unit of health, defined somehow) is often difficult, and only a fuzzy evaluation is possible, i.e., determining the range of values, such that when considering larger and larger numbers from within this range the decision maker would less and less confidently agree that she would be willing to pay as much.

The goal of the current project will be to construct and to verify the properties of a method of learning the preferences of decision makers within such a fuzzy approach (i.e., accepting that the decision maker perceives the relative importance of criteria fuzzily) based on a series of choices from between sets of decision alternatives, additionally assuming that the decision maker is capable of determining her subjective conviction towards the choice made (i.e., the conviction that the actually selected alternative is better than other alternatives present).

This general goal requires pursuing three more detailed sub-goals. Firstly, we plan to construct a mathematical description (a model) of a decision-making mechanism accounting for a fuzzy perception of criteria importance and satisfaction from the choice. The building blocks of this model will be based on the results of qualitative research, i.e., in-depth interviews (among SGH students) on what the process of their deliberating when making a multi-criteria choice (and when trying to assess the criteria importance and the overall choice satisfaction) is. Using the mathematical approach to modelling will allow introducing precise definitions, verifying the properties of the model formally, and extending the model by changing or adding components to the general framework. We intend to use a formal mathematical approach to modelling fuzzy entities (existing in the literature), which will allow—a bit paradoxically—discussing the lack of precision in decision maker thinking in a possibly precise way, enabling formal mathematical reasoning (e.g., proving theorems). At the same time, the structure of the model may help to explain the phenomena observed in real life, e.g., fuzzy approach to criterion importance may help to understand the observed differences between WTP (e.g., how much one would be willing to pay to reduce risk of illness) and willingness-to-accept (WTA, e.g., how much one would require to be compensated to increase the risk of illness by the same amount).

Secondly, we plan to develop a method of estimating the parameters of such a model based on the results of a series of choices along with information on the conviction towards the ultimate choice. There is a stream of studies in the literature developing the methods of preference elicitation (in general or in some very specific context, e.g., when juxtaposing the quality and longevity of life), as learning the preferences is a necessary starting point to supporting the decision maker in subsequent choices. The learning (and expressing in a quantitative way) the preferences often allows formally defining the concepts formerly considered as unmeasurable, e.g., identifying which health states are more preferred allows assigning utility values (numbers expressing the attractiveness), and so—in a sense—defining the *amount of health*. The current project aims to widen the palette of techniques and to show how we can use in the process the information on the satisfaction with the ultimate choice. The method to be developed will be tested based on data collected in a quantitative survey (among students), encompassing the series of choices to be made and questions on the satisfaction with the choice and criteria importance.

Thirdly, we aim to construct a method allowing the aggregation of information on individuals' preferences, so as to assess the joint, social preferences of a group (from which the individuals were randomly chosen) as a whole. Many multi-criteria problems are being solved by the public regulator, which has to make decisions determining the policy influencing the whole society (or some more narrow group of people). These decisions should then be based on some aggregate preferences. E.g., the decision to finance (or not) a medical technology requires the central regulator to understand the benefits of using this technology, and so the increment in utilities between the health state before and after the treatment, while we need to use a single set of preferences (it would be unethical to make different decision on the reimbursement of a drug due to differences in the preferences of the individual members of the society). In designing this method of preferences aggregation we will use statistical inference approach.