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Programming Languages

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Threats to validity

When we conduct a study, many questions arise relating to the reliability of the results and the conclusions made by the researchers. There is a current lack of replicability in many academic disciplines that highlight the need for objective classifications regarding how various methods and actions influence the outcome of experiments. From this classification, we have outlined what can influence an experiment to produce flawed results, known as the threats to validity.

Threats to validity are typically split into 2 large categories, Internal and External validity. Internal validity refers to the experiments were conducted in a way to support the claims they raise. External validity refers to the ability to bring the results out of the experiment setting to extend and apply them in real situations.

From Internal to External, the threats to validity are placed into further subcategories. Internal validity is connected to the events that occur between experiments, how long the experiments last, repetition in experiments, the bias that might be added from faulty or insufficient instruments, and effects relating to the continued interaction between test samples and researches that might introduce bias or confounding results. External validity is dependent on factors such as pretesting which could introduce bias or condition the experiment results to depend on a similar test being administered, how the experiment results may be correlated with the time interval they were conducted in rather than the exact experiments conducted, experiment settings such as specific controls or simplifications that may make the results impossible to without the same experimental arrangements, or the build up of multiple passes of an experiment, making it impossible to attribute the results to the experiment itself or its repeated application.

Together these criterion are though to influence either the causal relationships of the experiment results (for internal validity) and the ability to generalize the results outside of the exact experiment arrangements (for external validity). One-shot and zero-shot learning are applications of these principles in the optimization and training of various forms of complex machine learning algorithms such as transformers or neural networks.