**Machine Learning Papers in JSV**

In the last few years, JSV has been receiving a large number of papers relating to machine learning or ‘soft computing’ applied in a mechanical systems context. Many of these papers are rejected without review as they do not conform to the standards required of a JSV paper. This note is intended to explain what is necessary for a paper on machine learning to be substantial and original enough for archival publication in JSV.

The problem most often encountered is that the papers do not contribute to engineering knowledge. It is currently quite common for a paper to be submitted which is based on the analysis of a simple experimental rig (a rotor-bearing rig for example) using feature extraction and classification. It is not sufficient motivation for a new publication to base the paper on a ‘new’ feature or a ‘new’ classifier, particularly if the word ‘new’ only means the algorithm or feature has not been applied in the precise context before. Papers which appear to be based on this approach should be rejected without review.

There are a number of acceptable bases for publication:

1. A new application context is proposed or a new experimental data set is demonstrated. This presupposes that the data set has some new aspect not addressed by existing data e.g. the Case Western Reserve benchmark data for condition monitoring. Even with new data, the subsequent analysis should be principled and conform to best practice in the machine learning community. The most common reasons for rejection on the latter basis are that algorithm hyperparameters are not determined in a principled manner and that validation of the algorithm is not rigorous. The most common reason for validation to be questioned is that there are not enough training data and therefore generalisation is not confirmed.
2. A new feature for analysis is proposed that appears to be generally applicable and is superior to existing features in some clear respects. In order for such a paper to be published, the feature should be benchmarked on more than one data set and at least one data set should usually be experimental. An exception may be made in the latter case if simulated data is designed to include all the anticipated complexities of experimental data; however, this will need to be verified within the paper. Performance of the new feature must be established by comparison with existing features that are considered state of the art; papers will be rejected without review if there is no such comparison or if classifiers used with the old features are not demonstrably optimised.
3. A new classifier or regressor is proposed that appears to be generally applicable and is superior to existing classifiers in some clear respects. For such a paper to be published, the new algorithm should be benchmarked on more than one data set and again, at least one data set should usually be experimental. The new algorithm should be compared in a principled manner with an existing state of the art algorithm. By ‘principled’ this means that all algorithm hyperparameters should be optimised as far as possible. A common cause for rejection of a paper is that a new classifier, clearly tuned to the problem shown, is compared to an existing algorithm where hyperparameters are set in some suboptimal way so that fairness of the comparison is not evident.

The basic principle to adhere to is that, if a paper based on machine learning is not principled enough to appear as an applications paper in a machine learning journal, it is not principled enough for publication in JSV.

The reasons for setting ground rules in this manner is to save the efforts of referees; if it is clear to a handling editor that a paper fails in rigour or novelty in one of the respects discussed above, the paper will be rejected without review. Although this may seem harsh, it is also intended to benefit authors also, as works which do not satisfy the conditions for publication will not sit in the review system for long periods before ultimate rejection.