

Jordan University of Science and Technology

A Classification System for Predicting RNA Secondary Structure Elements

Authors: Monther Aldwairi, W. Alqarqaz, R. Duwairi

Abstract: RiboNucleic Acid (RNA) molecules fold back over themselves to form secondary structures which determine the RNA's functionality in living cells. RNA secondary structure can be determined in laboratory by X-ray diffraction and nuclear magnetic resonance (NMR) techniques. However, these techniques are slow and expensive. Therefore, computational approaches are used to predict the secondary structure of RNA molecules. A new approach, RNA-SSP, for predicting RNA secondary structure elements is proposed. It combines computational approaches and machine learning classifiers to predict individual structure elements using a new search heuristic. The approach is implemented and tested for hairpin loops and a methodology for extending the approach to predict the remaining secondary structure elements is proposed. The experiments showed a significant improvement in prediction accuracy to 95% for stem regions and 80% for loops. The overall weighted-average accuracy for predicting hairpin loop sub-structure is 89% with a sensitivity of 85.29%.