Title	Simple, Shareable, Online RNA Secondary Structure Diagrams
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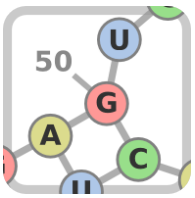
License	GPLv2



The visualization of RNA secondary structure is essential for describing its function. It depicts the inter-molecular pairing patterns that characterize its structure and provide hints as to the role that it might play within the cell. It provides a context for explaining experimental results. A mutation leading to a phenotypic variation can, in some cases, be described in terms of the change to the secondary structure that it induced. Conversely, analysis of the secondary structure diagram can provide hints about where to mutate a sequence in order to test a hypothesis about its biological role. Finally, RNA molecules can be categorized and classified according to their structure, the visualization of which gives researchers and practitioners a visual identifier for a particular class of RNA (most notably, for example, tRNAs and miRNAs).

The actual generation of an RNA secondary structure diagram, however, is not trivial and a number of techniques have been developed to generate visually pleasing and relevant layouts [1, 2, 3, 4, 5]. What most lack, however, is an easily accessible online interface to allow researchers to effortlessly generate beautiful, interactive, customizable diagrams. Our software, dubbed `forna`, is an online application that allows for dead-simple generation of secondary structure diagrams. It allows users to interactively manipulate the layout of the diagram, using a force-directed layout reminiscent jViz.RNA [4], but refined and made accessible online without dependencies.

In addition to providing an interactive, dependency-free, Javascript-based online secondary structure viewer, our software implements a number of features which make it easy for researchers to tailor their diagrams to maximize their expressive capacity. This includes interactively editing the underlying structure (rather than just the layout), overlaying coloring information to express relevant supplementary information such as probing data or conservation. More importantly, we provide a Javascript API to include our visualization container on any web page, allowing researchers to seamlessly share interactive secondary structure diagrams without having to externally generate them or requiring the user to download or allow external dependencies (such as Java) to view them. The result is a portable, reusable and accessible application for converting text-based secondary structure information to a descriptive visual representation which can easily be shared and disseminated.

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[2] Byun,Y. and Han,K. (2009) PseudoViewer3: generating planar drawings of large-scale RNA structures with pseudoknots. *Bioinformatics,* **25** (11), 1435-1437.

[3] Darty,K., *et al.* (2009) VARNA: interactive drawing and editing of the RNA secondary structure. *Bioinformatics,* **25** (15), 1974.

[4] Wiese,K.C. *et al.* (2005) jviz. rna-a java tool for RNA secondary structure visualization. *NanoBioscience, IEEE Transactions on,* **4** (3), 212–218.

[5] Hecker,N., *et al.* (2013) RNA secondary structure diagrams for very large molecules: RNAfdl. *Bioinformatics,* **29** (22), 2941–2942.