A Likelihood-Free Inference Framework for Population Genetic Data using Exchangeable Neural Networks

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NeurIPS 2018

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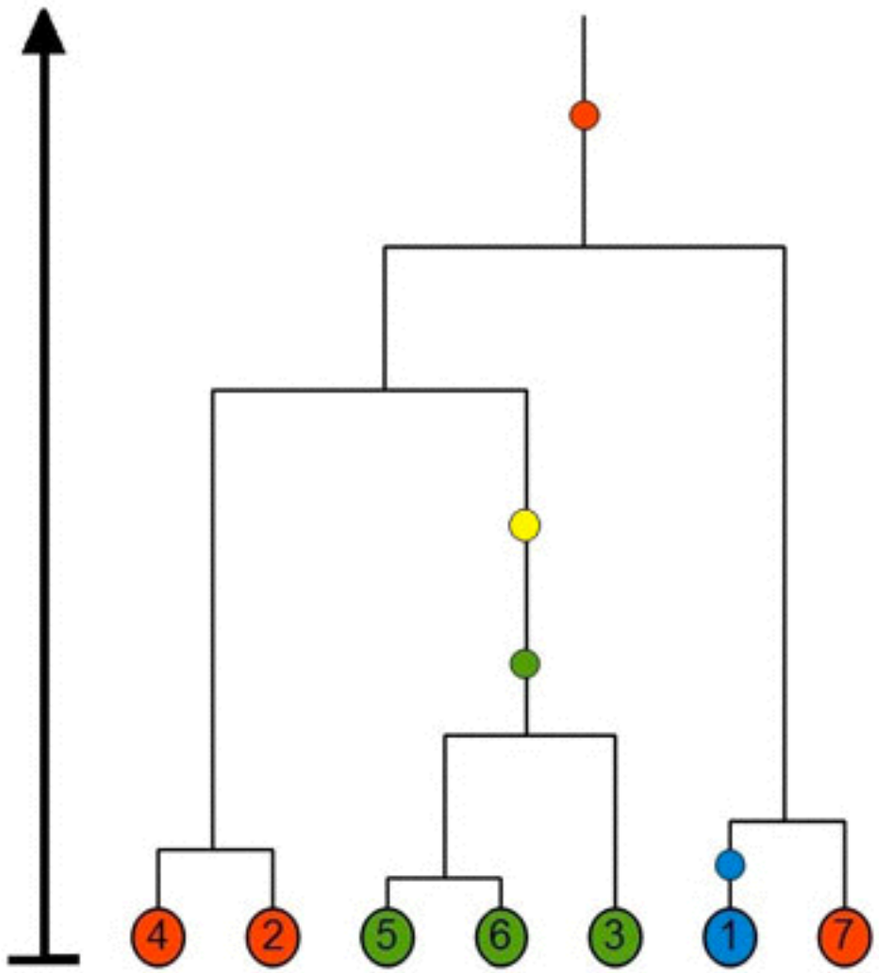
Population Genetic Data

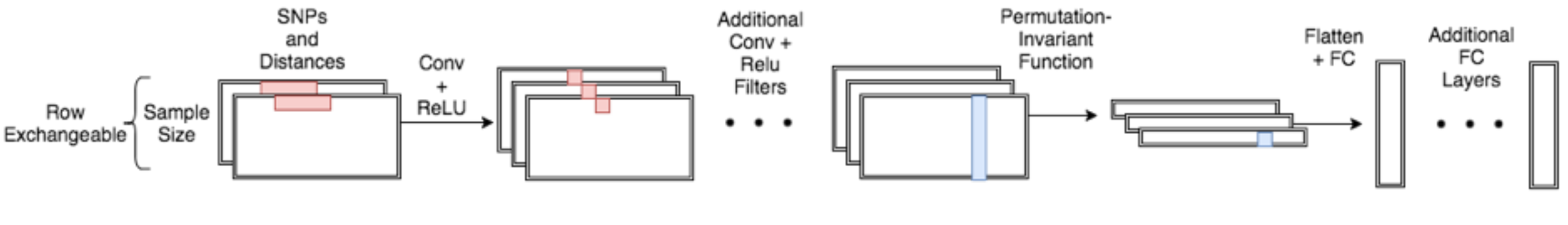
	SNPs	**Disease**
	000010000000	1
	000010000000	1
Individuals	010001011110	0
	010110001100	1
	010101001100	0
	111000010110	1

Kingman's Coalescent Model



- Cannot evaluate likelihoods
- Can draw samples from $P(X|\theta)$
- Traditional likelihood-free methods such as ABC
  - Difficult to tune
  - Scales poorly

Exchangeable Neural Network



Properties:

- Encodes permutation-invariance
- Produces calibrated posteriors
- Amenable to diagnostics and tuning
- Generalizes to many population genetic applications

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