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*Seminar on Stochastic Processes*

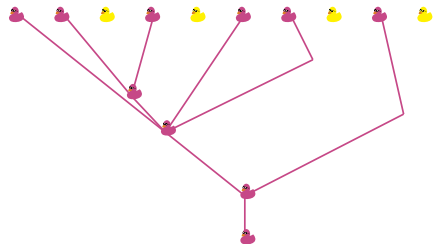
March 2025

# (Multitype) $\Lambda$ -Coalescents and Branching Processes

*arxiv:2501.00329*

*joint work with A. González-Casanova, N. Kurt & J.L. Pérez*

- The study of genealogies in population models is done often through coalescent processes.
- $\Lambda$ -coalescents generalize Kingman's coalescent by allowing multiple lineages to merge
- Branching processes model population growth dynamics over time.
- **Goal:** Explore a link between  $\Lambda$ -coalescents and continuous-state branching processes in the multitype case.



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## One-type case

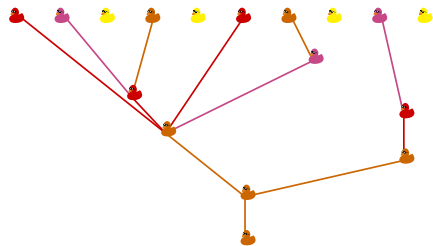
- ›  $\Lambda$ -coalescents: Exchangeable, consistent coalescent processes with specific merging rates.
- › CSBPs: Scaling limits of Galton–Watson processes.
- › Prior work (v.g. Bertoin & Le Gall, 2006; Birkner et al., 2005) showed links between these two objects.
- › **Main Theorem (Caballero et al., 2024):** Homeomorphism between the space of  $\Lambda$ -coalescents and the space of CSBPs.

## Multitype case

- › **Multitype  $\Lambda$ -coalescent:** Exchangeable, consistent multitype coalescent with no simultaneous mutations (Johnston et al., 2023).
- › **Main Theorem (González Casanova, Kurt, N., Pérez, 2025+):** Homeomorphism between multitype  $\Lambda$ -coalescents and multitype CSBPs, describing an explicit mapping.



- Our result provides a link between Johnston et al.'s multitype  $\Lambda$ -coalescent and multitype CSBPs.
- Open questions include: extensions to models with simultaneous mutations.



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