



A multi-purpose flexible rapid population synthesis code and library

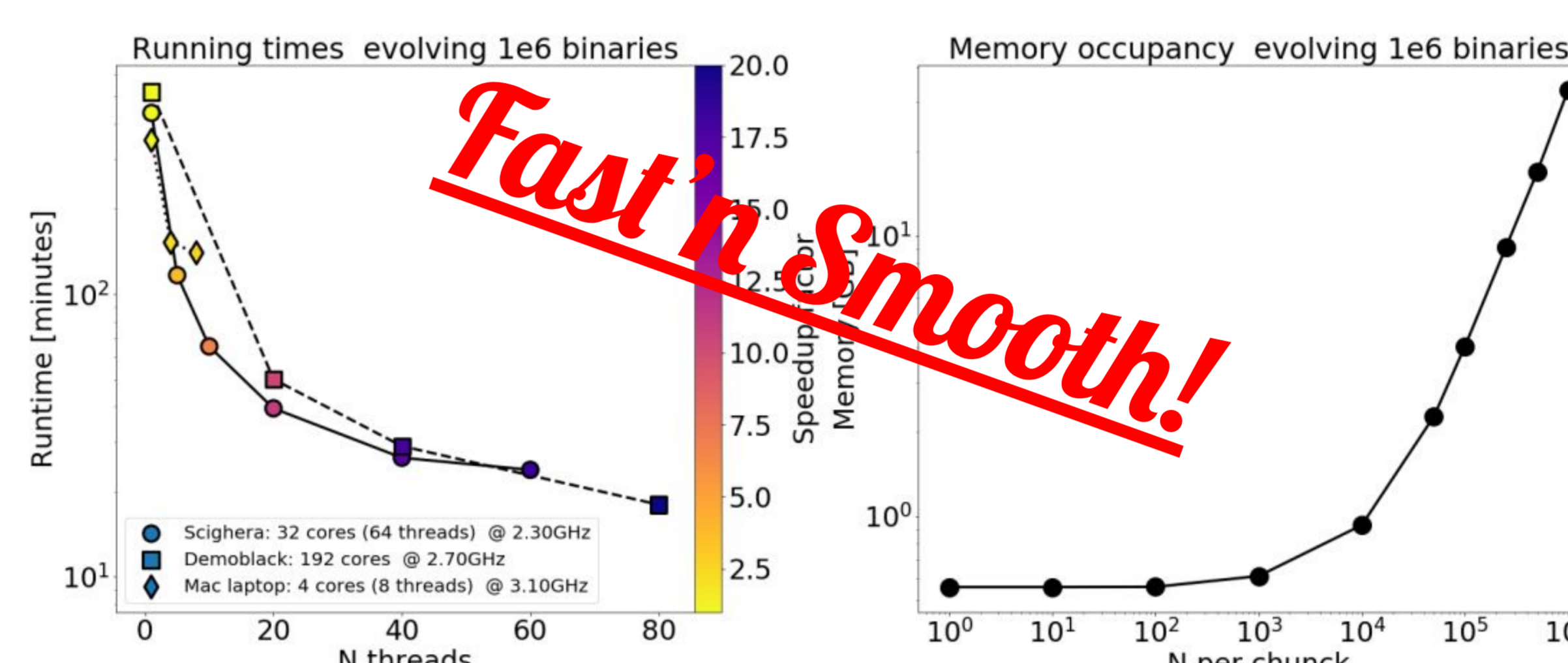
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WHAT IS SEVN

SEVN (Stellar Evolution for N-body)

- computes stellar evolution by interpolating pre-computed sets of stellar tracks chosen at run time. Already available tracks:
 - MIST
 - PARSEC
- Binary processes computed with up-to-date analytic and semi-analytic prescriptions
- Adaptive time step
- OpenMP parallelization
- Can be used both as stand-alone code or as a library for other codes (e.g. N-body codes)
- Source code in C++; Python front-end



SINGLE STELLAR EVOLUTION

Evolution tracks

- Stellar evolution is interpolated on the fly from pre-computed stellar tracks, chosen at run time.
- Track types:
 - Hydrogen stars
 - Pure Helium stars
- Current available stellar tracks:
 - PARSEC
 - Mass range: 2 Msun - 600 Msun (Hydrogen- star), 0.36 Msun - 350 Msun (pure_Helium stars))
 - Metallicity: 1E-11 - 0.04
 - MESA
 - Mass range: 0.7 Msun - 150 Msun
 - Metallicity: 1.4E-5 - 0.045

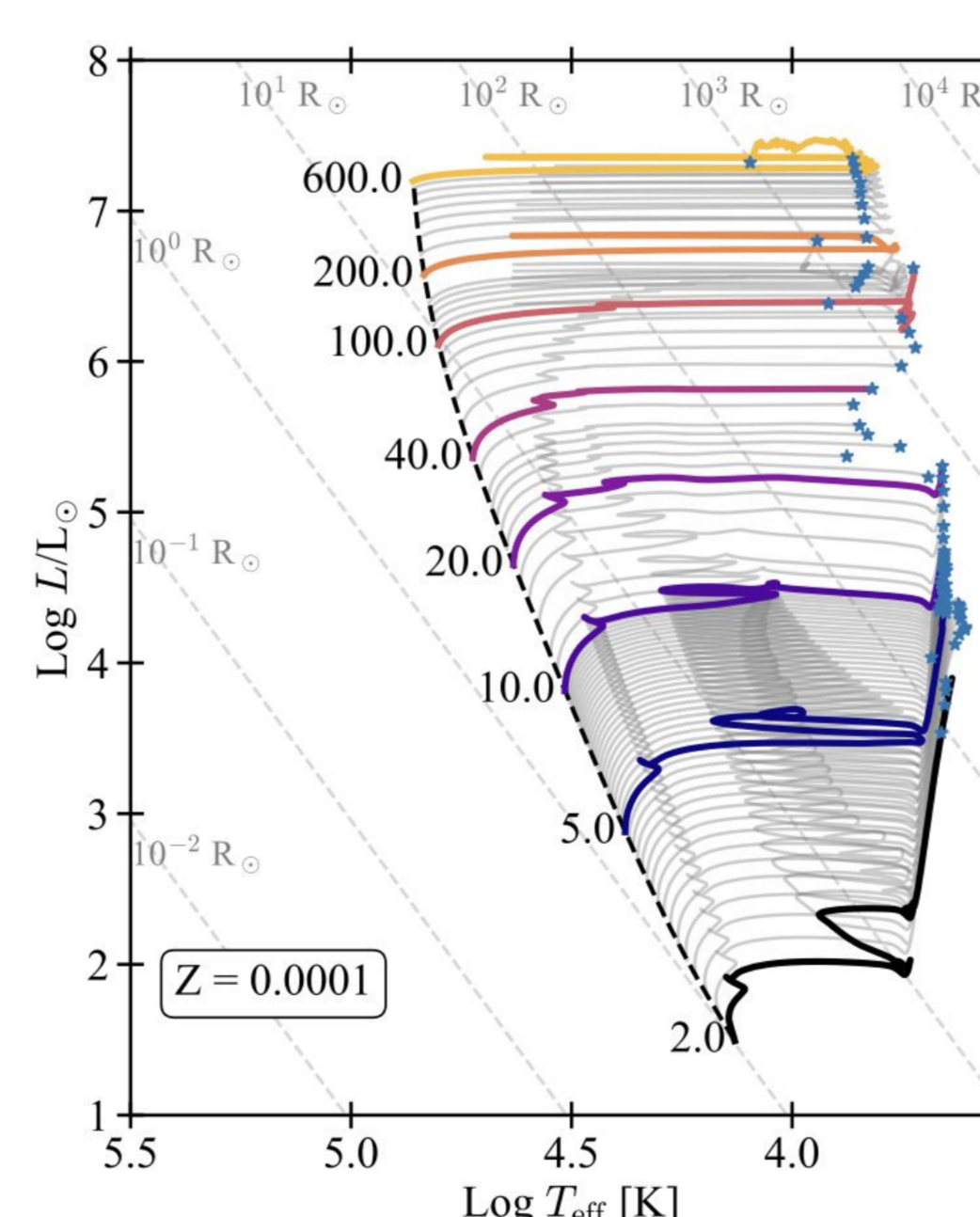
Flexible:

Use a new stellar evolution models is as simple as give to SEVN the path of the stellar tables at runtime.

Remnant formation:

SEVN uses state-of-the-art formalism to produce a compact remnant (black-holes, neutron stars, white dwarfs) at the end of the stars life. Different formalism can be set at runtime and new formalism can be easily added thanks to the modular structure of the code.

PARSEC stellar evolution tracks at metallicity $Z=0.001$ already available in SEVN



BINARY STELLAR EVOLUTION

Binary Processes

Binary processes computed with up-to-date analytic and semi-analytic prescriptions for:

- Roche lobe overflow - mass transfer
- Mergers
- Collisions
- Common envelope
- Gravitational-wave emission and merger
- Supernovae
- Natal kicks
- Spin of compact objects
- Angular momentum transfer
- Accretion

Flexible and Modular:

The modular structure of the code allows to easily extend the available processes with new formalism or to add new processes.



WORKS WITH SEVN

- Iorio et al. 2023, MNRAS, V.524, pp.426
- Costa et al. 2023, MNRAS, V.525, pp.2891
- Santoliquido et al. 2023, MNRAS, V.524, pp.307
- Sgalletta et al. 2023, MNRAS, V.526, pp.2210
- Korb et al., in prep.
- Escobar et al., in prep.
- Dall'Amico et al., in prep.

The paper



The GitLab Repo

