A New Class of Cosmologically viable $f(R)$ models

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Background

1. Alternative gravity models - to resolve problems of Cosmology?
2. $f(R)$ theories - toy-models in exploring alternative gravity cosmologies.
3. $f(R)$ theories are generally studied to be fit as the possible candidates for either dark energy, dark matter or both
4. Modified gravity models have been successful in explaining the flat rotation curves of galaxies.

Motivation

- No one definitive $f(R)$ model that possibly satisfies all the required criteria to be an alternative to ΛCDM model.
- Their viability is always judged based on it's ability to reproduce scale factor evolution as predicted by ΛCDM model.
- idea!
- To explore the possible new viable models assuming the universe is evolving with linear scale factor (at least during matter domination).

Linearly Coasting Universe?

- In general, some form of $f(R)$ is assumed and a fit with ΛCDM is expected/produced as a consequence.
- Such theories, try to achieve GR limit by giving back standard cosmology with $f(R)$ as the dark energy replacement.
- Any model of $f(R)$ looking to explain late-time acceleration is expected to give rise to a cosmology which also preserves the evolution sequence of the standard model viz.
  - early inflation
  - radiation domination era (during which BBN occurs)
  - a matter dominated era
  - and the present accelerated epoch.

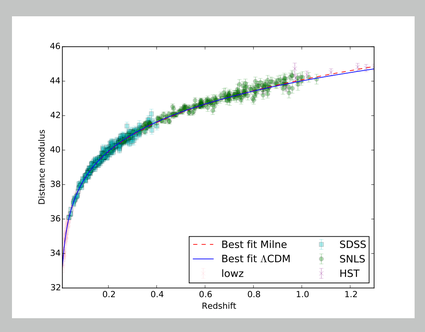

Figure 1: Linearly Coasting Universe vs

Methods

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- Viewpoint Matching Constraints
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Mathematical Section

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$$X \to r(X) = \arg\max_c \left\{ \max_n \left\{ \sum_{x_i \in X} \delta(x_i, Y_{n,c}) \right\} \right\}$$

  - Cras faucibus scelerisque cursus. Proin ut vestibulum augue. $\delta(x_i, Y_{n,c})$
- Fusce tempus arcu id ligula varius dictum. Donec ut nisl dui, ac consectetur

Results: Table

- Ased Aliquet Luctus Lectus

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table 1: Table caption

- Sollicitudin Vel Orci
- Maecenas Ultricies Feugiat Velit Non Mattis.

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table 2: Table caption

Method of Approach

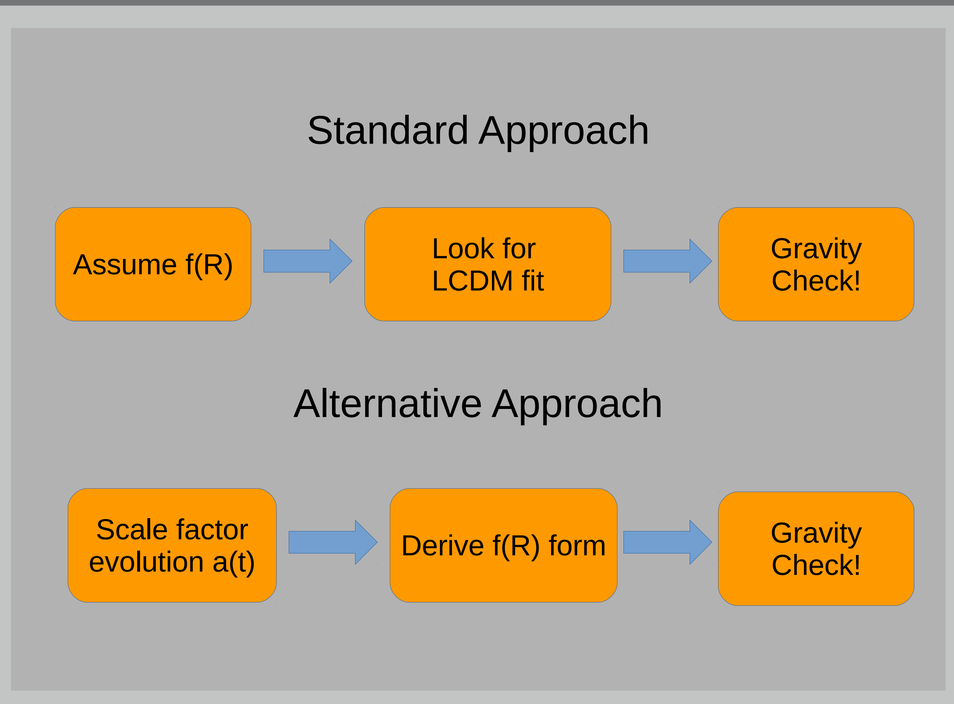

Figure 2: Approach for new 'viable' $f(R)$

Conclusions

- Assuming a linearly coasting scale factor, we derived a potentially new 'viable' forms of $f(R)$.
- While some forms may look familar, they need to be re-evaluated in the light of linear coasting.
- There are few options on constraining $f(R)$ models other than Cosmology
  - linear growth rate of structures
  - gravitational weak lensing (tsujikawa2009dispersion)
  - CMB and structure formation theories
  - weak field limit from the solar system tests
  - gravitational wave observations
- These areas are to be explored in the subsequent work(s).

References

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