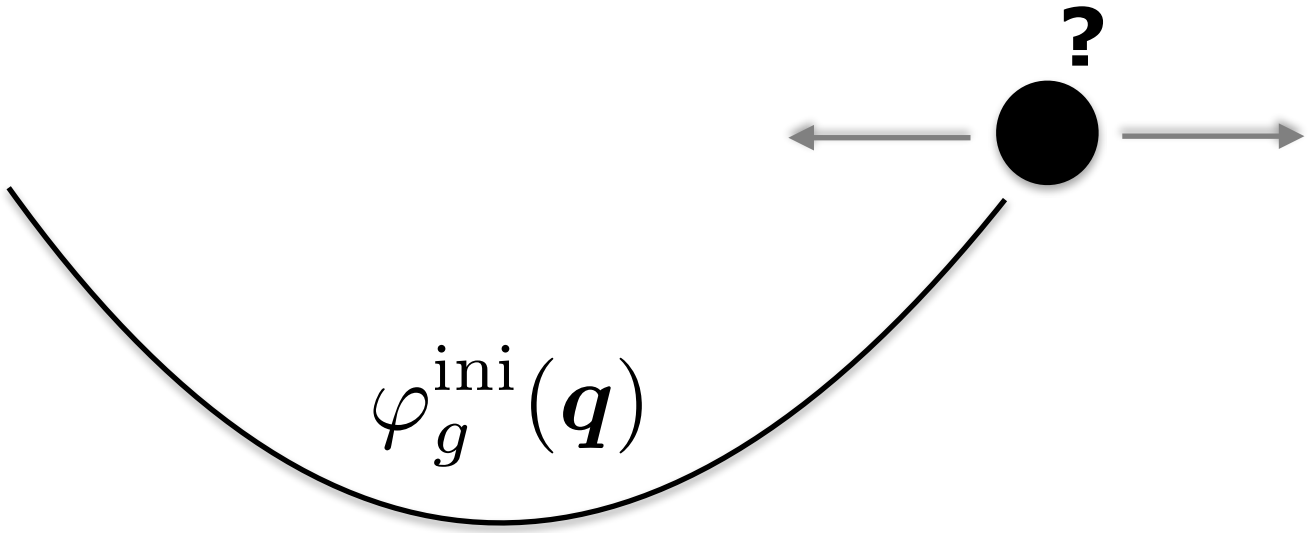
Lagrangian Dynamics

Approximate: Shoot Particles

follow initial gravitational potential

$$\boldsymbol{v}(\boldsymbol{q}, a) = -\boldsymbol{\nabla}\varphi_g^{\mathrm{ini}}(\boldsymbol{q})$$



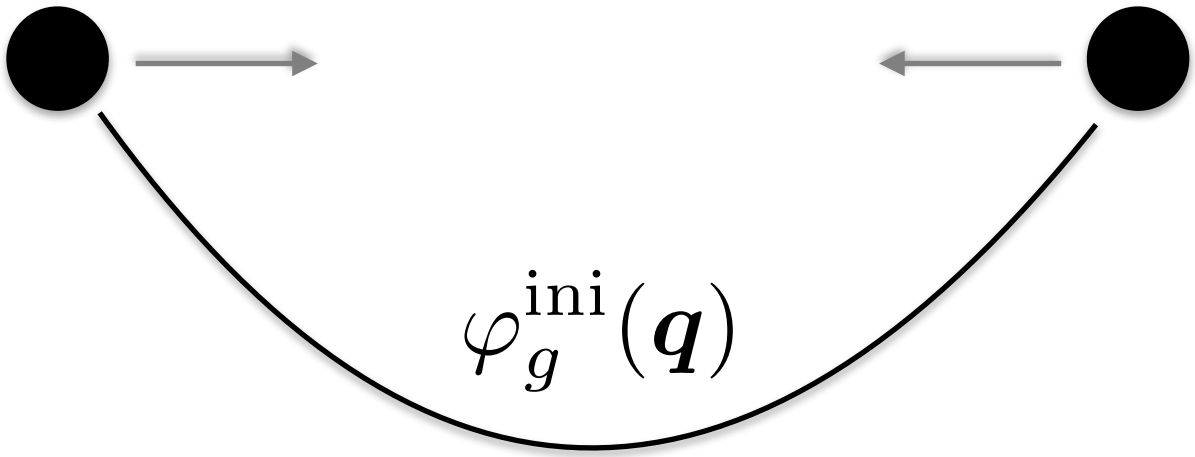
Lagrangian Dynamics

Approximate: Shoot Particles

follow initial gravitational potential

$$\boldsymbol{v}(\boldsymbol{q}, a) = -\boldsymbol{\nabla}\varphi_g^{\rm ini}(\boldsymbol{q})$$

$$\boldsymbol{x}(\boldsymbol{q}, a) = \boldsymbol{q} - a\boldsymbol{\nabla}\varphi_g^{\rm ini}(\boldsymbol{q})$$



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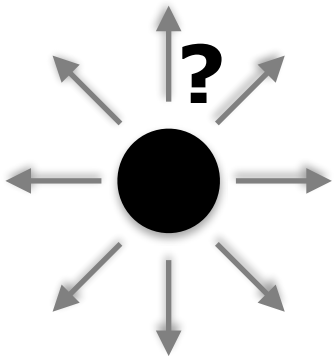
Zel'dovich

+ tidal effects

Coordinates & PT

x: 'standard' Eulerian (SPT)

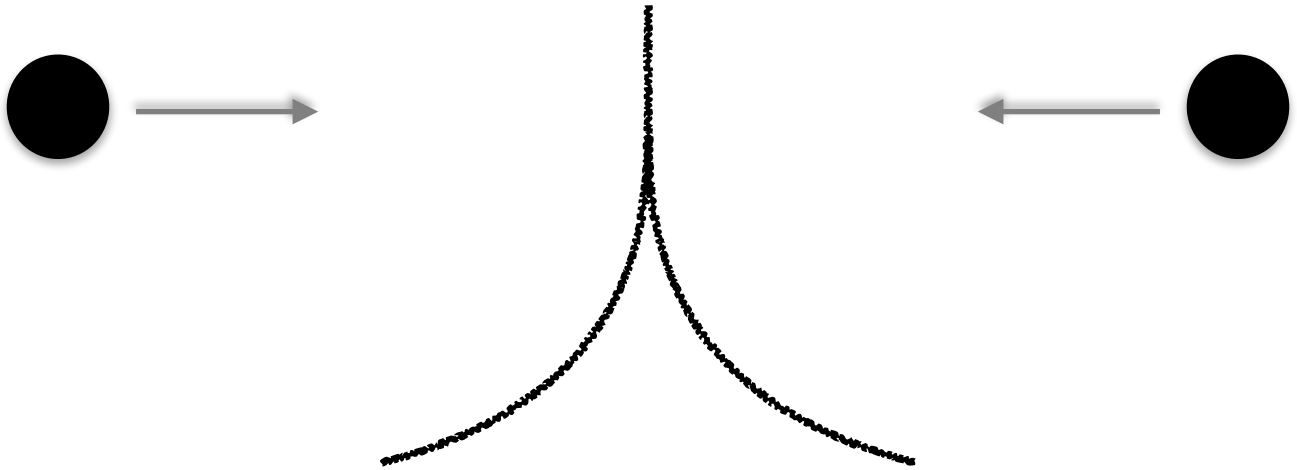
q: Lagrangian (LPT)



Lagrangian Dynamics

Problem: Overshooting

shell-crossing: singular density



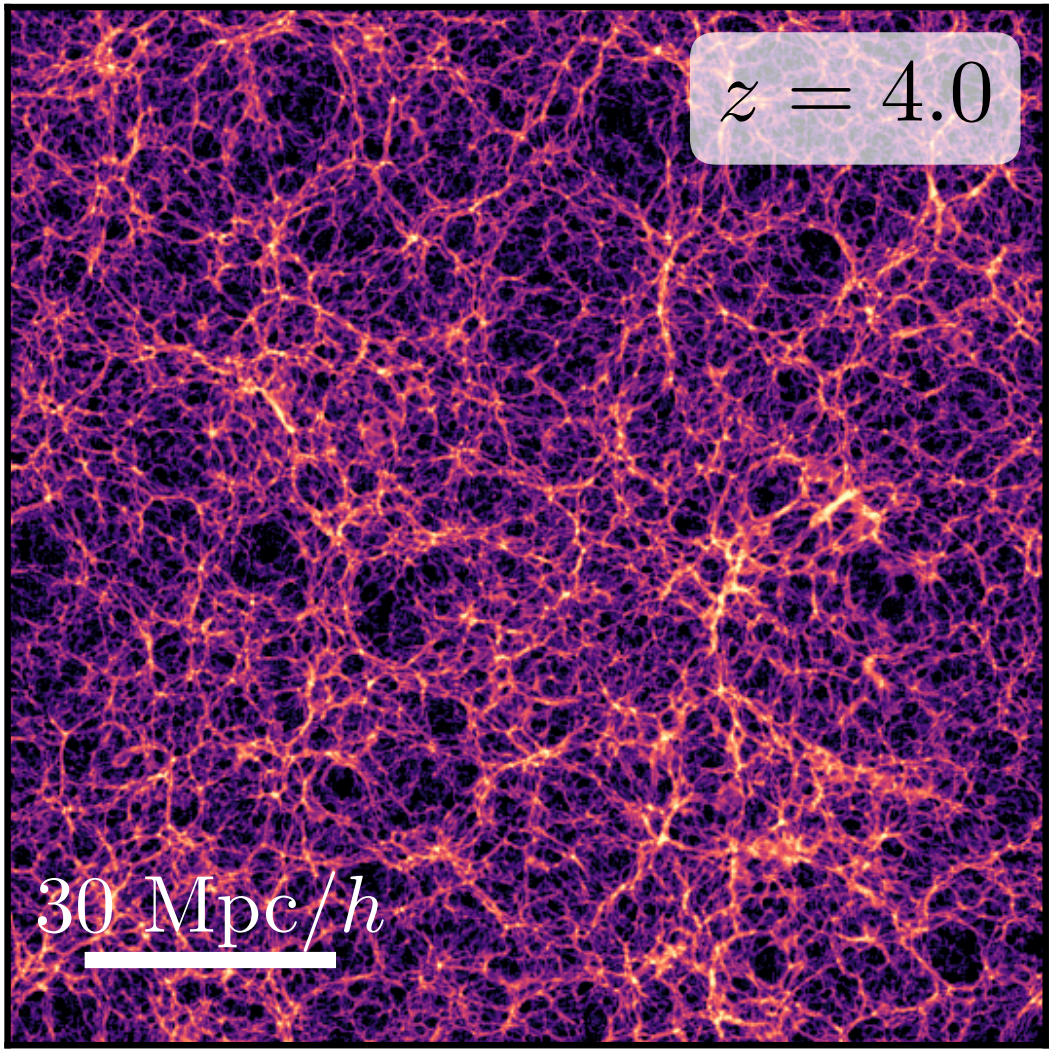
no comeback after fly-through

useful for times shortly after shell-crossing

Lagrangian Dynamics

1LPT

CDM ICs



Zeldovich Approximation