Differentiability on the space of measures and applications to mean field control/games

- Outline
  - I) Space of measures
  - II) Differentiability of the space of measures
  - III) Mean field control
  - IV) Mean field games.

Motivations

IV) (• Macroeconomy (= heterogeneous agent models) ('90)
• Finance = many interacting traders)

III) (• Smart charging of a crowd of electrical vehicles)

I) Space of probability measures

- (X, d) = locally compact metric space.
- $\mathcal{P}(X)$ = space of Borel proba on X.

Ex: given $x = (x_1, \dots, x_N) \in X^N$

$(N \in \mathbb{N}^*)$, $m_x^N = \frac{1}{N} \sum_{i=1}^{N} \delta_{x_i} \in \mathcal{P}(X)$