Smooth Animations to Visualize Gaussian Uncertainty

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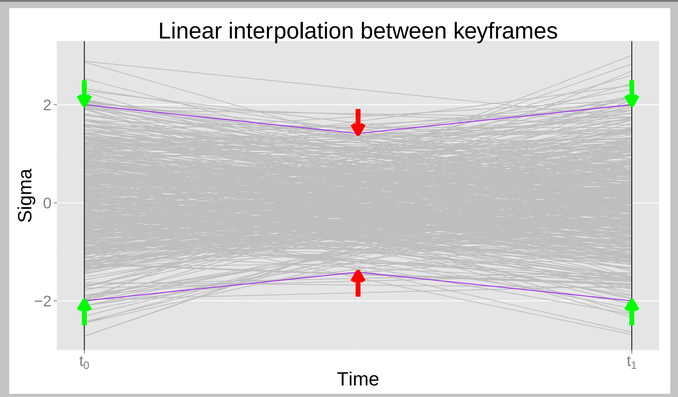
Introduction

- **Goal:** Visualize uncertainty in *curves and surfaces*
- **Approach:** animations
  - Each frame shows one draw from posterior
  - Consecutive frames differ infinitesimally (i.e., *continuous* animations)
- **Results:**
  - **Smooth, keyframe-free** animations (moving *beyond interpolation*)
  - **New framework** for all future work in Gaussian animations

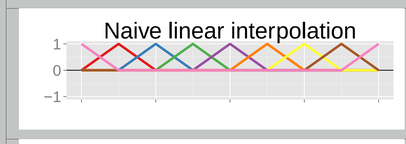
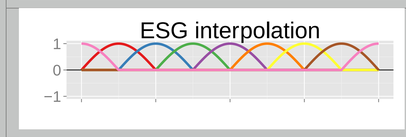
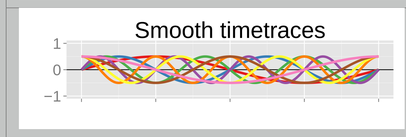
Interpolation caveats



Naïve interpolation: **variance too small** between keyframes

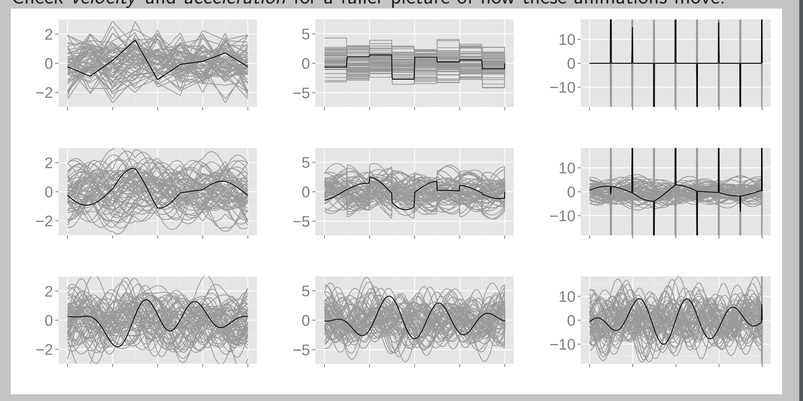
Next up: make side-by-side figure with ESG. Show **actual** quantiles. (Means I need to make x-values and interpolate...)

Basis function view

Animation Method	Statistically Correct	Stationary	Smooth
	✗	✗	✗
	✓	✗	✗
	✓	✓	✓

Physical motion: basic kinematics

Check *velocity* and *acceleration* for a fuller picture of how these animations move:



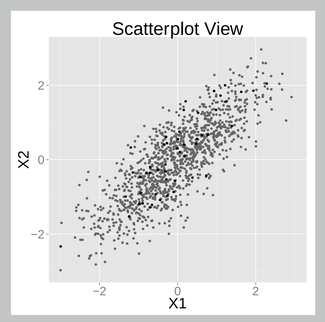
Motion is *not different* at the keyframes **because they do not exist.**
(Also: add the dots, in the plots!)

The Infinite Limit

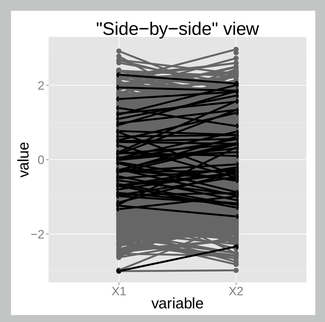
Conclusion

Gaussian Processes refresher: Probabilities for Functions

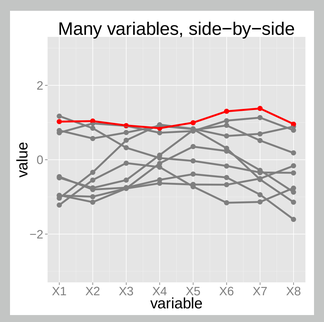
- Random curves and surfaces: *infinitely many* random variables!
- **Gaussian Processes:** work with *any* **finite** *subset*
  - Assume *joint Gaussian distribution*
- Simple example: Start with 2 variables, work up from there...



- Highly correlated → **close to diagonal**
- Works well for two variables



- Highly correlated → **horizontal lines**
- Works well for more variables...



- Variables indexed by *position*

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