Functional Data Analysis (Lecture 5) - Registration

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Registration

- Key routines:
  1. Smoothing with monotone constraint: smooth_monotone
  2. Registration: landmarkreg, register_fd
- Bug in 'smooth_monotone.m' (next page).
- fd objects: +/-/mean is OK.
- ginput(1): landmarks; (x, y) coordinate of click.

Monotone smoothing

Bug in smooth_monotone: Kmat (=[ ]) $\times$ vector $\Rightarrow$ error.

```
-----
if lambda > 0
  if isempty(fdParobj)
    Kmat = eval_penalty(basisobj, Lfdobj);
  else
    Kmat = getpenmat(fdParobj); %we get '[]' at this line!
  end
else
  Kmat = [];
end
-----
```

Monotone smoothing: patched

```
if lambda > 0
  if isempty(getpenmat(fdParobj))
    Kmat = eval_penalty(basisobj, Lfdobj);
  end
else
  Kmat = [];
end
```

Patched function: on my webpage.

Task-1: PCA

1. Finish PCA on natural images.
2. +hint: col2im.

Task-2: registration

1. Take 'FDA: growth' data (year: 1-18).
2. Steps:
   1. Apply monotone smoothing (growth).
   2. Register the acceleration curves:
      - landmark ($F = 1$): last 0-crossing of acceleration, downwards.
      - continuous: initialized with landmark registration.
3. Solution (checking/if you get stuck): on my website.