Broken Functions

1. Summary
   - Convolution
   - BLR test

2. Q&A

3. Problems

Announcements
- 1/21 added

Convolution - \( \{(g \ast h)(x) = \int_{\mathbb{R}} g(y)h(x-y) \, dy \} \)

**Theorem.** \( \hat{g}(\xi) \ast \hat{h}(\xi) = \hat{f}(\xi) \)

\[ \xi = \xi_x \]

\( H \) - rows/columns, \( x \) - character

\[ (H_{x,y})^* = (1, x_y) \cdot (1, 15) < 0 \]

Let \( \text{diag}(g) \in \mathbb{R}^{(g^T + g)} \), diagonal

\[ \text{diag}(g)_{xy} = g(xy) \]

**Claim:** \( (H \cdot \text{diag}(g))_{x,y} = \hat{g}(\xi) \)

165. it's equal to \( \)\( \)

1. \( x_y \), \( -1 \)

Proof (for \( \text{diag}(g) \)) - \( \text{diag}(g) \)

\[ \sum_{z = 0}^{15} g(z \cdot 2^2) = \hat{g}(\xi) \ast \hat{h}(\xi) \]

BLR - given every access to \( f, \xi \)

\[ F_{\xi} = \{ \xi \} \]

check if its linear, \( \langle f, \xi \rangle = \langle f, \xi \rangle \)

for all \( x, y \).

Choose \( x, y \) at random, check if:

\[ \langle f(x), f(y) \rangle = \langle f(x), f(y) \rangle \]

Acceptance probability is \( \frac{1}{2} + \frac{1}{2} \sum \hat{f}(\xi)^2 \)

If \( \hat{f} \) is constant \( \sum \hat{f}(\xi) = \sum \hat{f}(\xi) + 1 \)

on just one \( \xi \), \( \sum \hat{f}(\xi) = 1 \)

spread out \( \sum \hat{f}(\xi) = \sum \hat{f}(\xi) + 1 \)

\( \hat{f} = \hat{f}(\xi) \cdot \hat{f}(\xi) \)

Jensen's inequality is \( 0 < \xi x \)

\[ E \left[ (f(x))^p \right] \leq E \left[ (f(x))^q \right] \]

\[ \| f \|_p = \| f \|_p \]

Commutivity

Each week - 1 assignment

\( L. \) breakouts

Problem 1 - Rooms 1, 2, 3

Problem 2 - Rooms 2, 3

Problem 3 - Rooms 2, 3

Problem 4 - Rooms 3, 4