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2. Best fit parabola

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Recitation due Sep 13, 2021 20:30 IST Completed

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In the last video, Christine explains how one can try to fit a collection of data (x_i, y_i) to a parabola using the formula:

$$y_i = ax_i^2 + bx_i + c$$

The deviation formula is now a function of three variables, a, b, and c.

$$f(a,b,c) = \sum_{i=1}^{n} (y_i - ax_i^2 - bx_i - c)^2 \tag{4.220}$$

Find partial with respect to a

4/4 points (graded)
The deviation formula is:

$$f(a,b,c) = \sum_{i=1}^{n} (y_i - ax_i^2 - bx_i - c)^2. \tag{4.221}$$

Find the partial derivatives of $f(a,b,c)$ and obtain a system of three equations and three unknowns.

$\frac{\partial f}{\partial a} = 0$ can be written as a linear equation of a, b, and c of the form

$$a\sum_{i=1}^{n}(A) + b\sum_{i=1}^{n}(B) + c\sum_{i=1}^{n}(C) = \sum_{i=1}^{n}(D).$$

Find the expressions A, B, C, and D in terms of x_i and y_i.

(Type `x_i` for x_i. Type `y_i` for y_i.)

$A =$ x_i^4 ✔ **Answer:** x_i^4

$B =$ x_i^3 ✔ **Answer:** x_i^3

$C =$ x_i^2 ✔ **Answer:** x_i^2

$D =$ y_i*x_i^2 ✔ **Answer:** x_i^2*y_i

Submit You have used 1 of 25 attempts

Answers are displayed within the problem

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Partial with respect to b

4/4 points (graded)
The deviation formula is:

$$f(a,b,c)=\sum_{i=1}^{n}\left(y_i-ax_i^2-bx_i-c\right)^2. \tag{4.222}$$

$\frac{\partial f}{\partial b}=0$ can be written as a linear equation of a, b, and c of the form

$$a\sum_{i=1}^{n}(A)+b\sum_{i=1}^{n}(B)+c\sum_{i=1}^{n}(C)=\sum_{i=1}^{n}(D)\,.$$

Find the expressions A, B, C, and D in terms of x_i and y_i.

(Type `x_i` for x_i. Type `y_i` for y_i.)

$A=$ x_i^3 ✔ **Answer:** x_i^3

$B=$ x_i^2 ✔ **Answer:** x_i^2

$C=$ x_i ✔ **Answer:** x_i

$D=$ y_i*x_i ✔ **Answer:** x_i*y_i

Submit You have used 1 of 25 attempts

Answers are displayed within the problem

Partial with respect to c

4/4 points (graded)
The deviation formula is:

$$f(a,b,c)=\sum_{i=1}^{n}\left(y_i-ax_i^2-bx_i-c\right)^2. \tag{4.223}$$

$\frac{\partial f}{\partial c}=0$ can be written as a linear equation of a, b, and c of the form

$$a\sum_{i=1}^{n}(A)+b\sum_{i=1}^{n}(B)+c\sum_{i=1}^{n}(C)=\sum_{i=1}^{n}(D)\,.$$

Find the expressions A, B, C, and D in terms of x_i and y_i.

(Type `x_i` for x_i. Type `y_i` for y_i.)

$A=$ x_i^2 ✔ **Answer:** x_i^2

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$B =$ x_i ✔ **Answer:** x_i

$C =$ 1 ✔ **Answer:** 1

$D =$ y_i ✔ **Answer:** y_i

Submit You have used 1 of 25 attempts

Answers are displayed within the problem

Find the best fit quadratic

3/3 points (graded)

Find the parameters a, b, and c that minimize $f(a,b,c)$ for the function defined above on the set of data

$$(0,1)\,, \quad (2,1)\,, \quad (4,3)\,.$$

$a =$ 1/4 ✔ **Answer:** 1/4

$b =$ -1/2 ✔ **Answer:** -1/2

$c =$ 1 ✔ **Answer:** 1

Submit You have used 1 of 25 attempts

Answers are displayed within the problem

2. Best fit parabola

Topic: Unit 3: Optimization / 2. Best fit parabola

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- Grader wrong in first parts — 7
  I did not simplify my answer in the first 2 parts (had to divide the whole equation by a constant to get the correct answer), however ...
- 3×3 Linear System Solver? — 8
  I used Wolfram Alpha to invert a 3×3 matrix and multiply by a 3-vector. Is there some symmetry I'm missing, or is this equivalent to s...
- fyi: system solver...sympy.org — 4
  i used sympy.org to solve the matrix problem.
- Could not format HTML for problem. Contact course staff in the discussion forum for assistance. — 10
  The rendering for Part 1 is blowing up on me. At one point it was also displaying a message about not being able to import SystemRa...
- [staff] 2*x^y, 2*x^4, 2*x^3, 2*x^2 — 3
  Why there is not a 2 in the derivatives? I mean the derivative of a square should have a 2 in front, but the solutions do not have a 2 i...
- System of Equations
  Hi. Could someone please explain how the last row of the matrix has 20 6 3 instead of 20 6 1. "1" was liste... t.

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[Staff] What are the Points to fit Quadratic to? **3**

At 8:38pm EDT 8/26, I read the question as asking to fit to points: (0,1);(2,1);(4,3). But in previous video, the points were (0,1);(2,1);(3,...

[Staff] Issue with the grader / very last question. **13**

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