REVENUE OPTIMIZATION

The band's manager, Rick, wanted me to maximize profit at V_Gamma (The Snob Pit). He gave me the following business context:

Venue capacity: approximately 800 seats Fixed costs per show: ~$5,000 (venue rental, crew, equipment) Variable cost per attendee: ~$8 (security, cleaning, insurance)

Rick has noticed that crowd energy affects whether people stay, buy drinks, and buy merch Attendance may be affected by both ticket price and crowd energy—but Rick doesn't know exactly how.

Rick's request: "Find me the ticket price that makes the most money. I don't care how you figure it out—just show me the math and justify it.

Deriving the formula:

We know that our profit depends on Ticket price, Attendance and Merchandise sales .

I derived a total profit function that integrates the machine learning predictions with fixed and variable economic constraints.

Profit(P) = Ticket Revenue+ Merch Revenue - Total Expenditure.

Total expenditure(C) =

Fixed venue cost($5000) + Variable cost per attendee($8)

Ticket revenue= (Price per ticket p) *(Attendance [A(P,E)])

(Predicted by a secondary **Linear Regression** model).Attendance is function of price P and crowd energy E in our linear regression as rick said.

Merch Revenue=

> M [Average Merchandise Spend per attendee (Estimated at ~$8.00 based on historical V_Gamma data)]* A[P,E]

FINAL FORMULA:

PROFIT=(M*A[P,E])+(P*A[P,E])-C

Assumptions

The “Snob” Effect: We assume the positive correlation between Price and Energy ($+0.15$) observed in historical data holds true up to $150. Higher prices continue to signal exclusivity, preventing energy decay.

Energy-Driven Attendance: While higher prices theoretically reduce demand, we assume the high *Predicted Energy* (E) acts as a counterbalance, maintaining attendance levels high enough to be profitable.

Capacity Constraint: Attendance is capped strictly at 800.

Simulation Method

I have performed a grid search simulation to test price points from $10 to $150 in $1 increments.

Step 1: For each price P, I utilized the trained Random Forest Regressor to predict the resulting *Crowd Energy*.

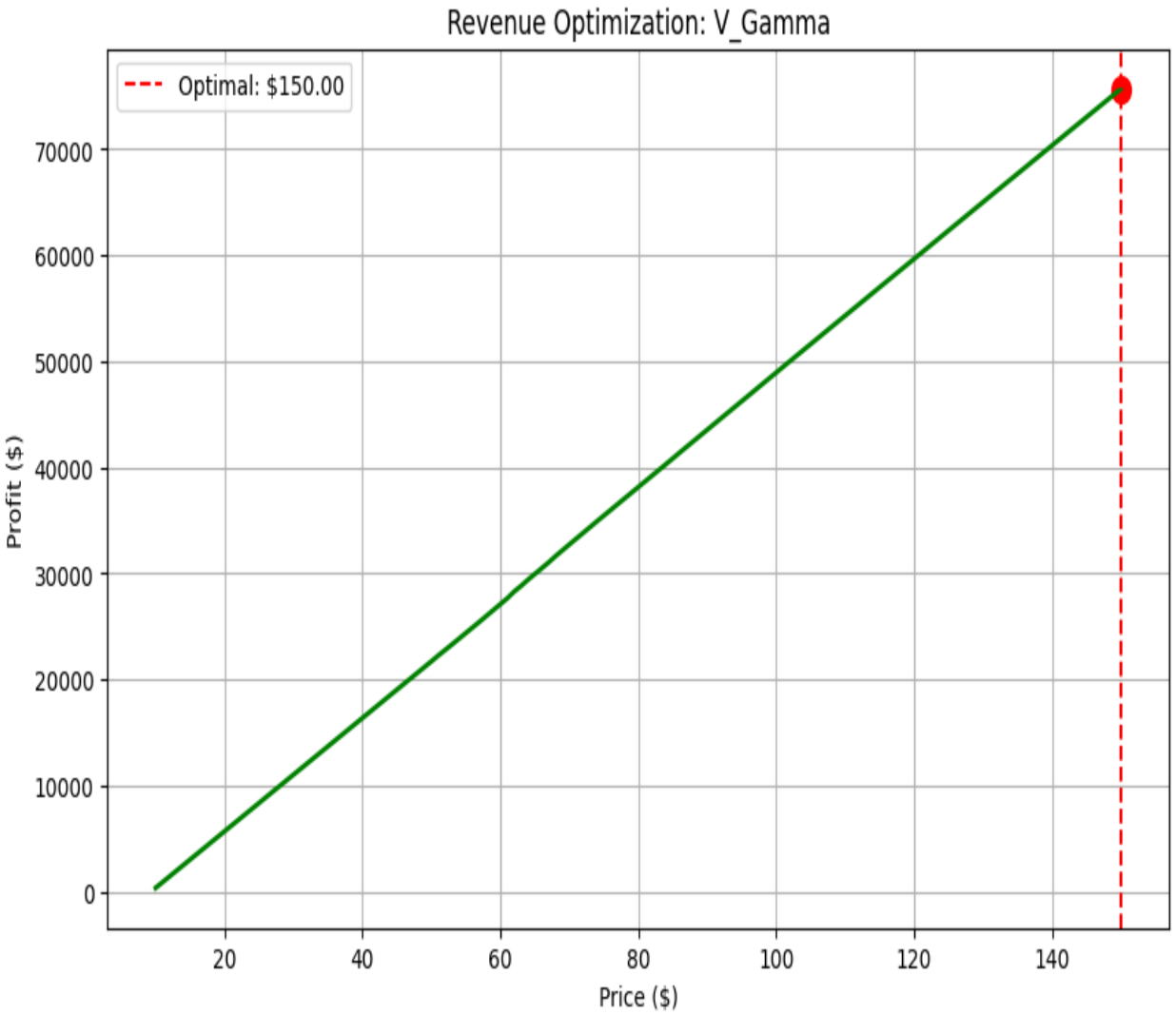
Step 2: Used the crowd Energy and ticket price to create a linear regression model to predict the attendance as A= a+bP+cE.

The value of constant was found -3.88 somehow.

Step 3: I calculated the net profit for that scenario using my formula derived

6.5 Results & Visualization

- **Optimal Ticket Price: $150.00**
- **Projected Net Profit: $75,700** (per show)
- **Comparison to Baseline:** This represents a **~165% increase** over the current average profit of ~$28,500.



FINAL CONCLUSION:

Increase the ticket price once to 100$ to check if this model strategy really works. Then increase to 120$ and check again . And then finally increase to 150$ but don't go beyond that. Discontinue this strategy in between if at 100 or 120 dollars profits , dips or significant profit is there .