Alzheimer's Disease RNASeq Research Recommendations

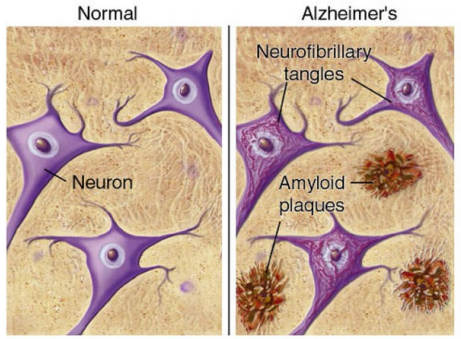
By Jamie Carnevale

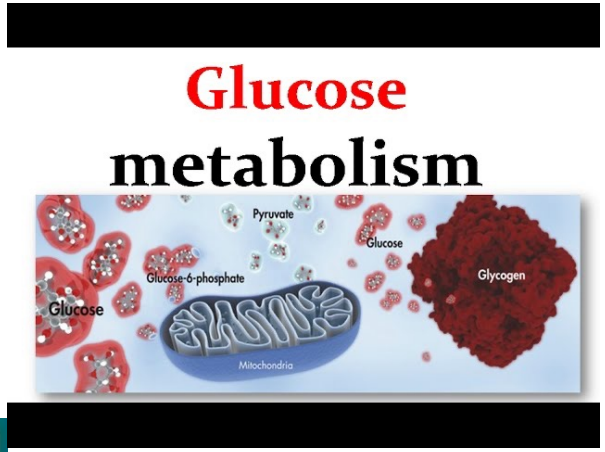
How is Alzheimer's Characterized?

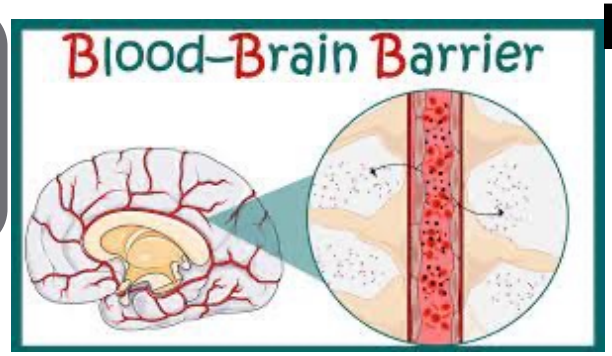
Classic View - Amyloid Beta Plaques

Glucose Metabolism Problems

Blood-Brain Barrier Dysfunction







RNA-Seq in Alzheimer's Research

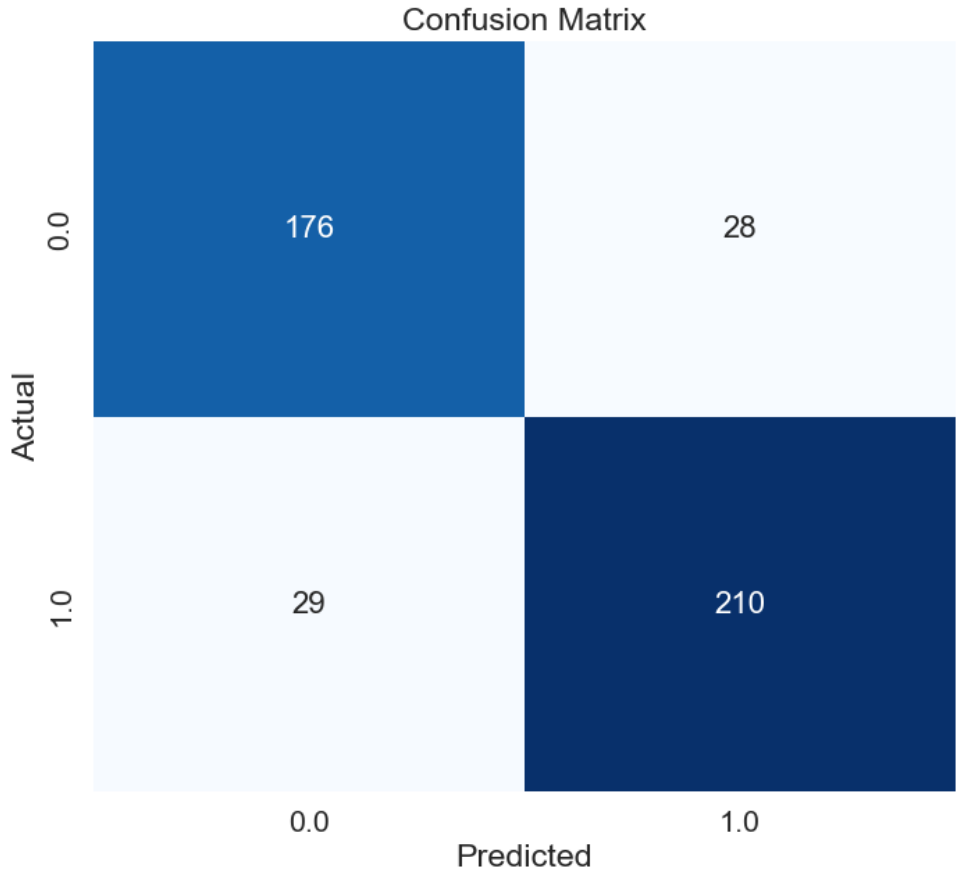
- **What is RNA-Seq?**
- **How RNA-Seq Works**:
  - extracting RNA
  - make cDNA (complementary DNA) from it
  - cDNA is sequenced to recreate RNA (this time with labels)
  - ran through machine to translate labels into sequence data
- **RNA-Seq in Alzheimer's Research**: RNA-Seq allows us to monitor changes in RNA expression in the brain and identify novel targets for treatments
  - can apply machine learning to this data

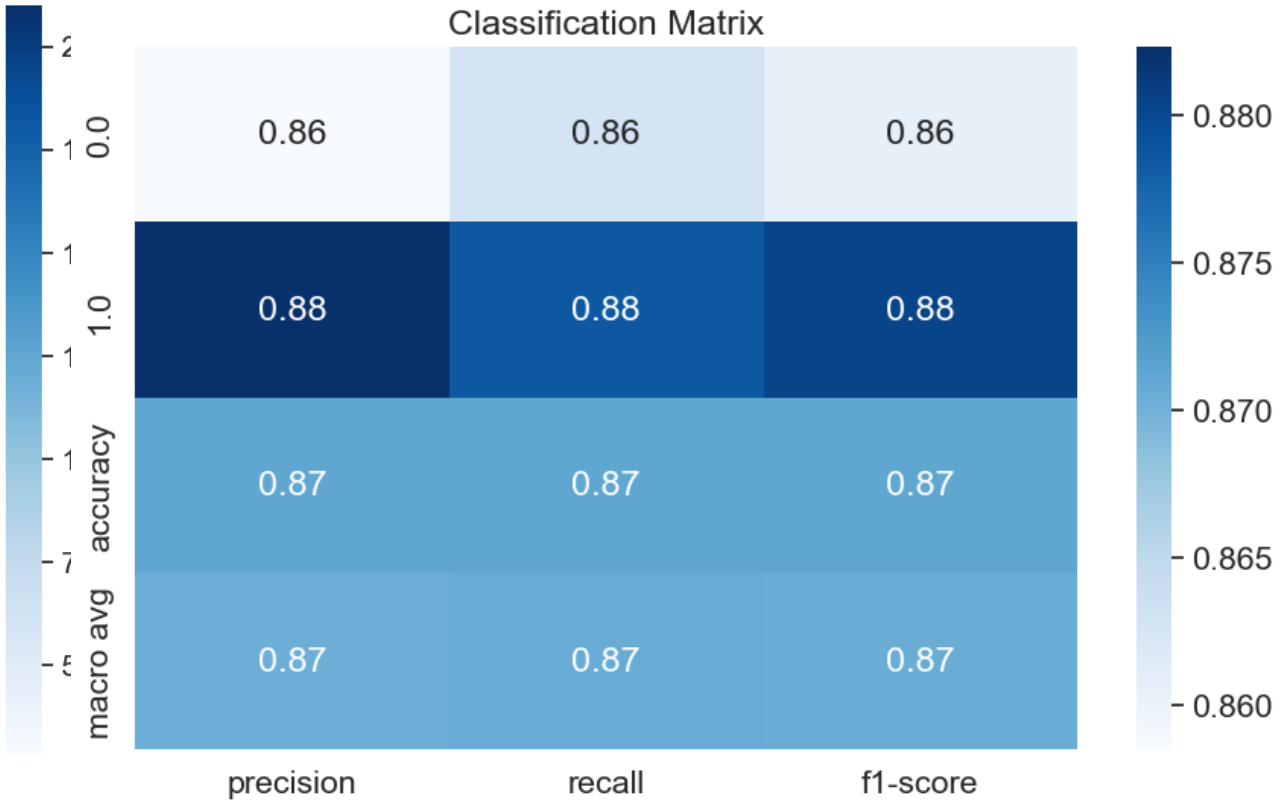
Data Source and Definitions:

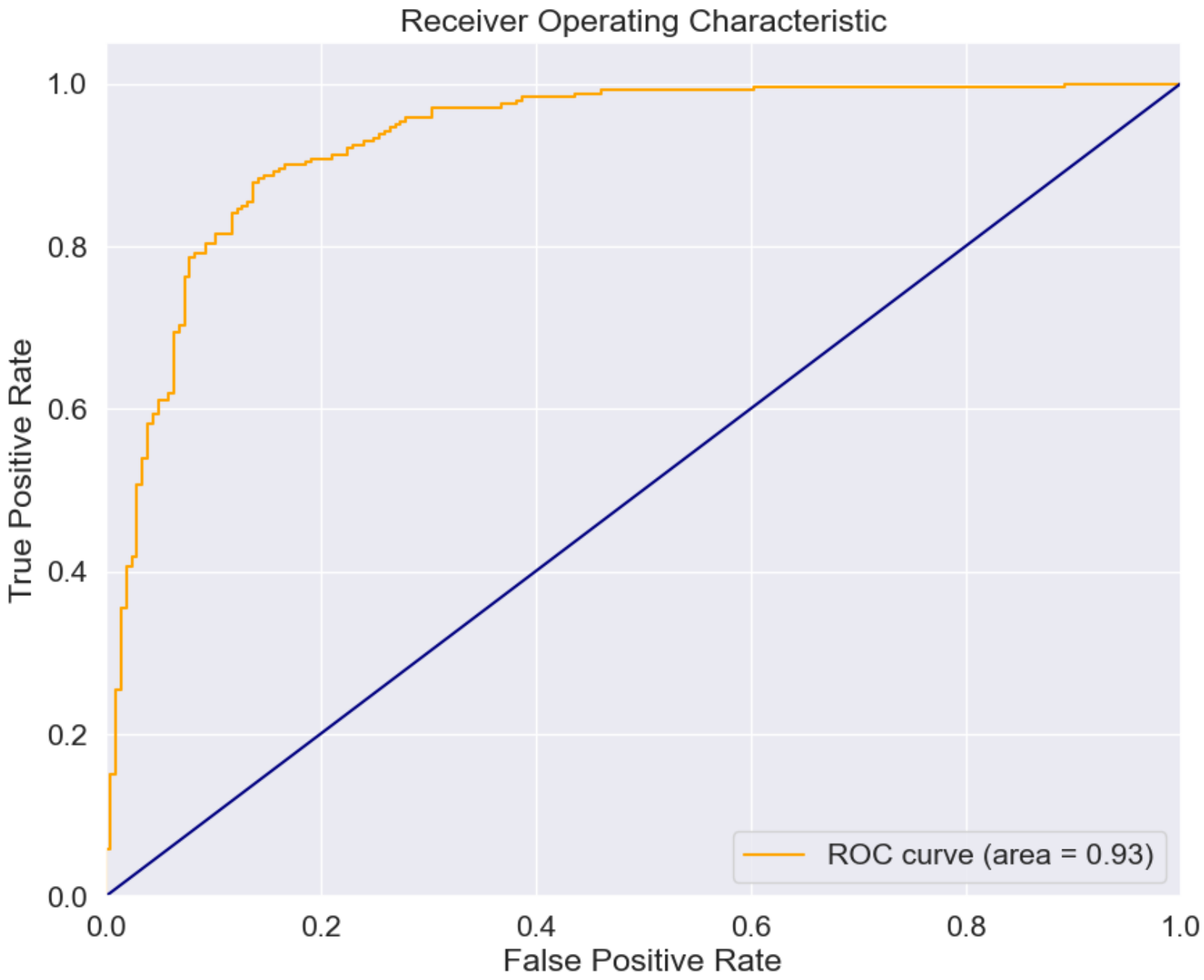
- Data Sources:
  - **ROSMAP** (Religious Orders Study and Memory and Aging Project)
  - **MSBB** (Mount Sinai Brain Bank)
  - **MAYO** Clinic Study
- Key Metric:
  - **Residual Counts**:
    - Normalized gene expression data
      - reduces technical variation and make samples more comparable
      - high values = high RNA expression
      - low values = low RNA expression

Best Model: Logistic Regression

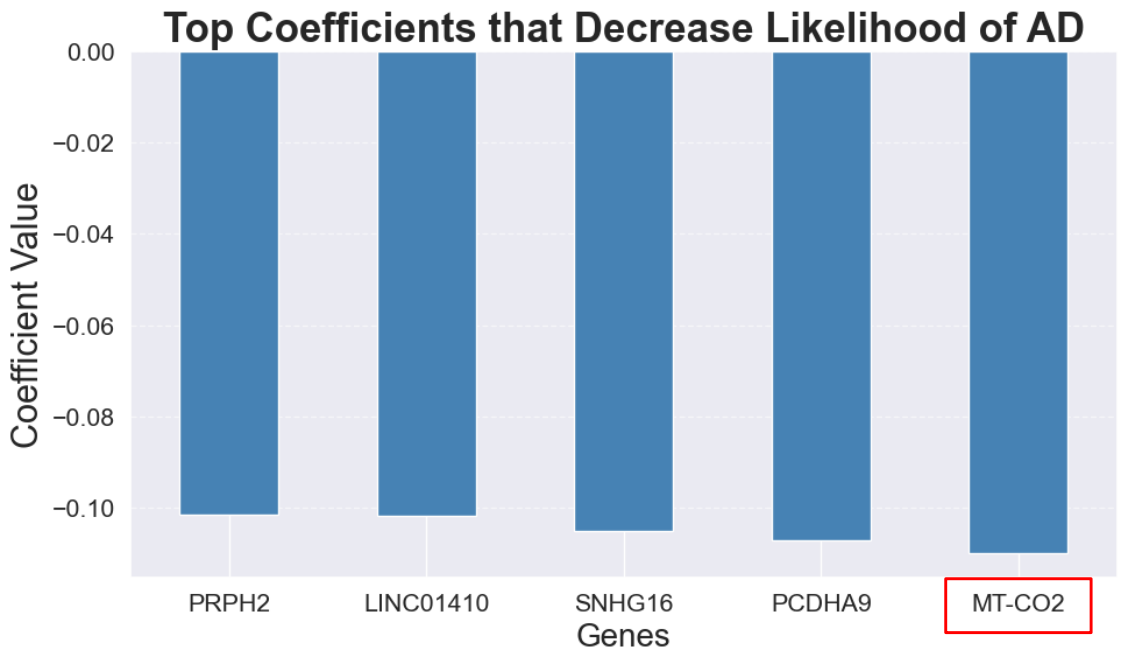
- Accuracy: 87%
- ROC_AUC: 93%

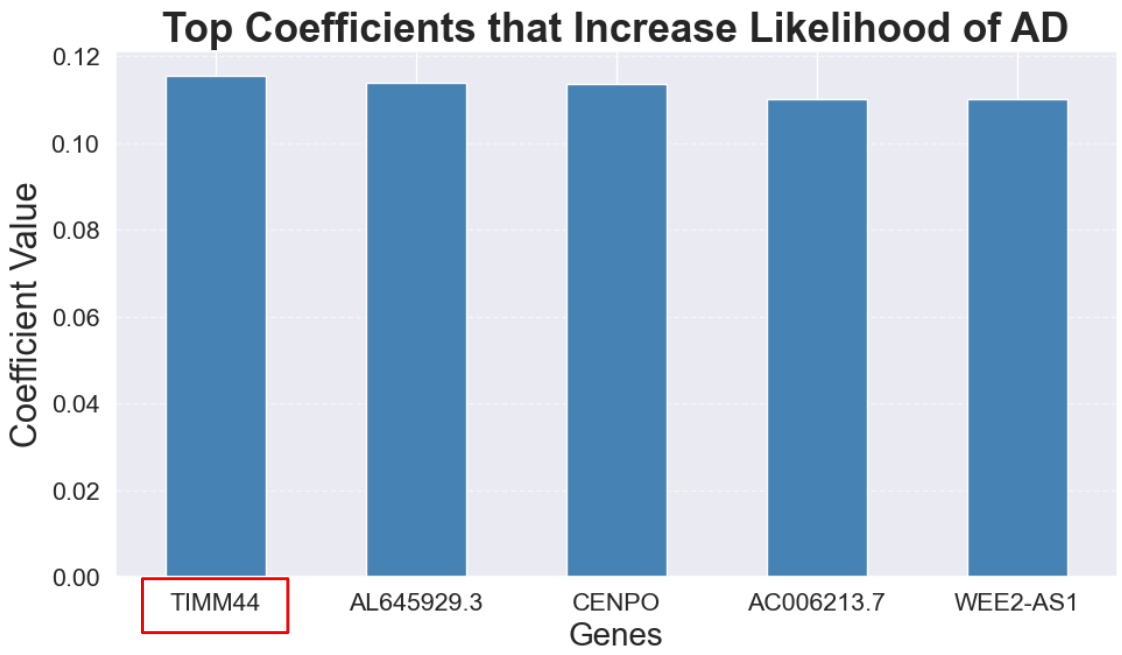




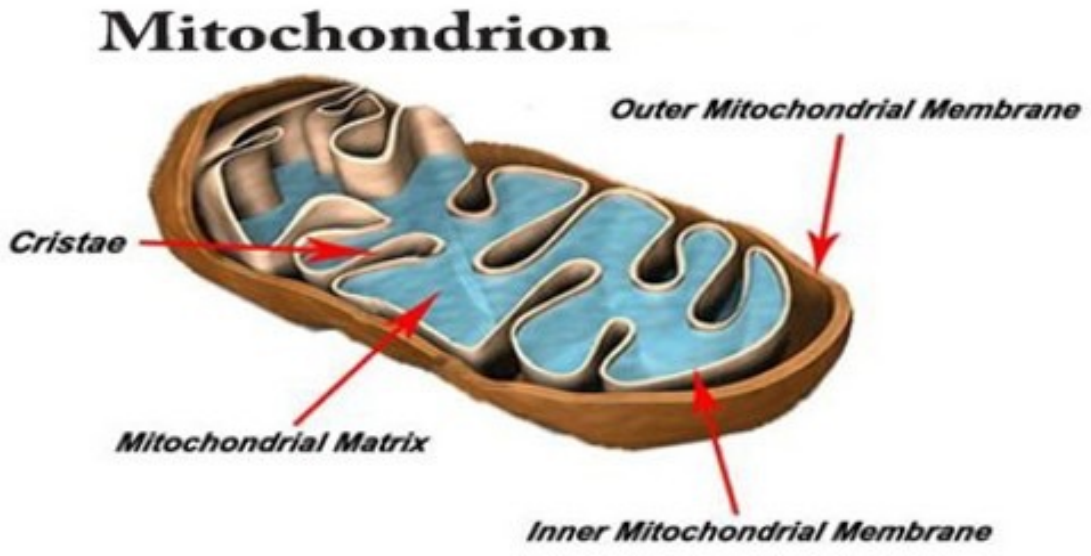

Receiver Operating Characteristic
True Positive Rate
False Positive Rate
0.0
0.2
0.4
0.6
0.8
1.0
ROC curve (area = 0.93)

Logistic Regression Weights





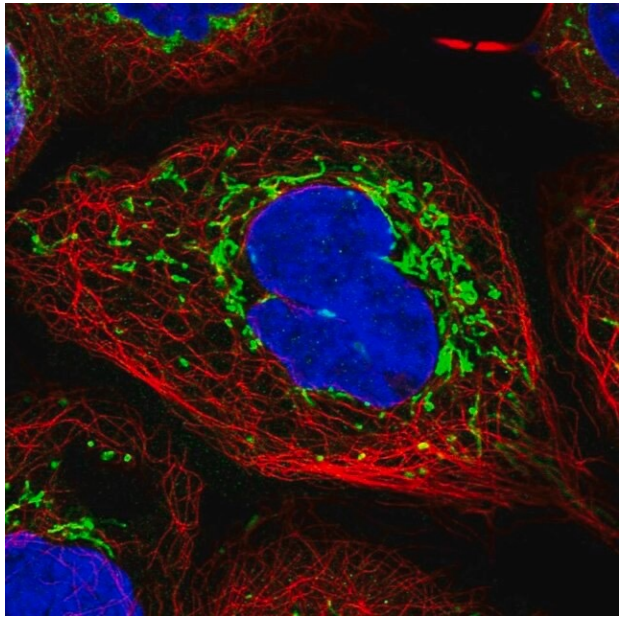
Key Genes:



- **TIMM44:**
  - **Description:** TIMM44 is involved in mitochondrial protein import machinery, having a role in energy production and glucose metabolism within cells.
- **MT-CO2:**
  - **Description:** MT-CO2 codes for an integral component of the mitochondrial respiratory chain, a crucial system for energy production in the cell. It significantly influences cellular glucose metabolism.

Next Steps

- Analyze and model on Whole Genome Sequencing for TIMM44 and MT-CO2
  - look for variants between Alzheimer's and Control
- Perform biological research Techniques on TIMM44 and MT-CO2
  - e.g. immunohistochemistry
- Gather more data, model on that and see if model coefficients change or if we can get a higher accuracy



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Thank You