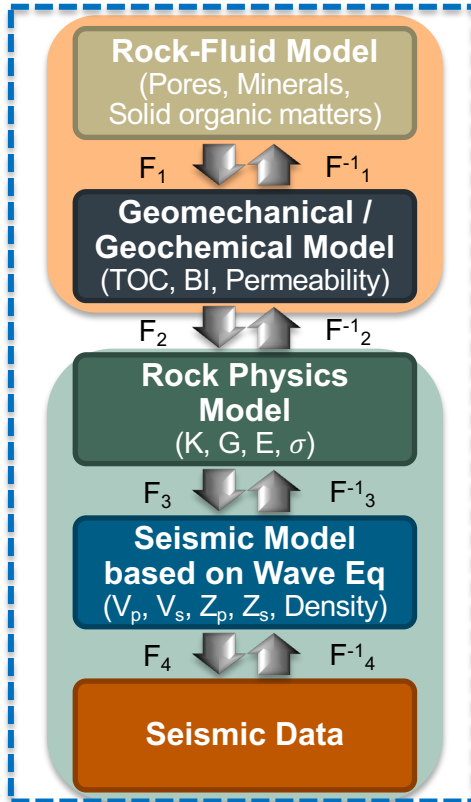


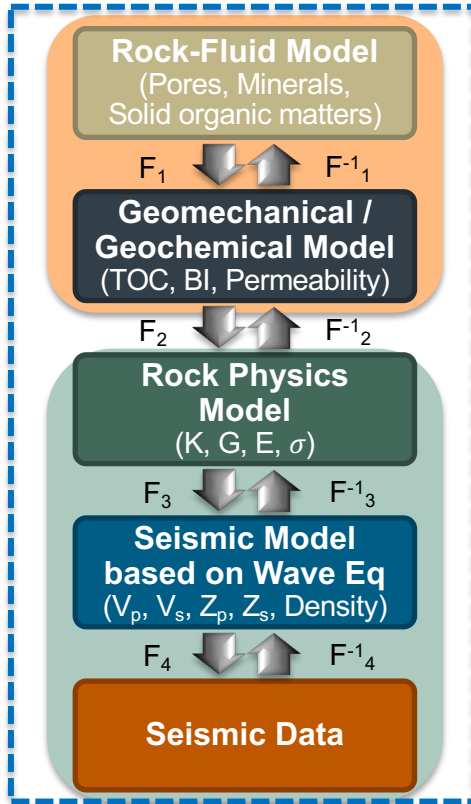
# Jaewook Lee (Ph.D., 2017-2022)



## Improved Reservoir Property Estimation for Unconventional Shale Reservoirs

- Developing a statistical shale rock physics model and a more accurate shale reservoir property estimation method for unconventional reservoirs
- Improving seismic AVO modeling and inversion to detect the sweet spots for better shale reservoir characterization
- Applying machine learning (ML) techniques for enhanced reservoir property estimation

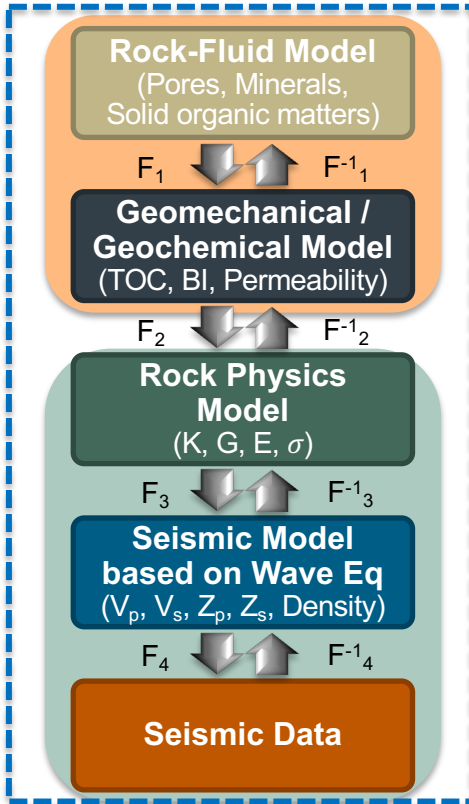
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## 1. Statistical Shale Rock Physics Modeling

- Exploratory Data Analysis (EDA)
- Multivariate linear regression analysis
- Nonlinear regression analysis
- Sensitivity analysis (e.g., Frechet sensitivity test)
- **Total Organic Carbon (TOC)**: Lee & Lumley, 2019 SEG
- **Brittleness Index (BI)**: Lee & Lumley, 2020 AAPG
- **Shale matrix permeability**: Lee & Lumley, 2021 AGU

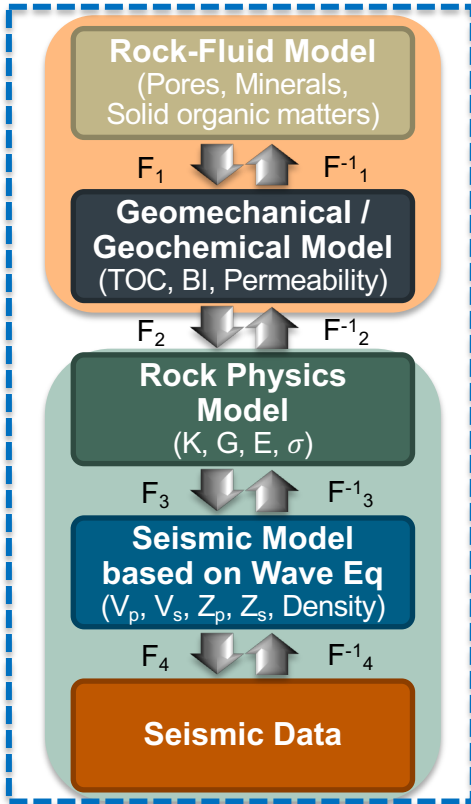
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## 2. Seismic AVO modeling & Inversion

- Statistical shale rock physics modeling
- AVO attributes for TOC and lithology ( $V_{\text{Clay}}$ ) prediction
- Synthetic seismic AVO modeling
- Robust seismic AVO inversion to estimate two shale properties from seismic data
- **AVO attribute analysis and seismic modeling**  
: Lee et al., 2020 URTEC
- **AVO inversion with real seismic data**  
: Lee & Lumley, 2022 (in progress)

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## 3. ML-based Reservoir Property Estimation

- Linear and nonlinear regression analysis
- Supervised ML (e.g., Deep Feed-forward Neural Nets)
- Unsupervised ML (e.g., K-means Clustering)
- Shapley value analysis
- **Improving TOC estimation by using deep learning**  
: Lee et al., 2022 AAPG Bulletin (accepted)
- **Predicting BI by using deep learning**  
: Lee & Lumley, 2022 JPSE (submitted)