Hands-on: First SHAP Analysis Workflow

1 **Setup**
`pip install shap`

2 **Load Data**
`load_boston()`

3 **Train Model**
`RandomForest`

4 **Explain**
`TreeExplainer`

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💻 Complete Code Example

```
import shap
from sklearn.ensemble import
RandomForestRegressor
from sklearn.datasets import load_boston


# Load dataset
X, y = load_boston(return_X_y=True)


# Train model
model =
RandomForestRegressor(n_estimators=100)
model.fit(X, y)
```

📈 Key Insights

🎯 What You'll See:

- Waterfall plot showing feature contributions
- Base value (average prediction)
- Each feature's push/pull effect
- Final prediction value

💡 Interpretation Tips:

- Red bars = increase prediction
- Blue bars = decrease prediction
- Bar length = importance magnitude
- Sum of all = deviation from base

⚙️ Model Options:

- TreeExplainer: XGBoost, LightGBM, RF
- KernelExplainer: Any model (slower)

```python
# Initialize explainer
explainer = shap.TreeExplainer(model)

# Compute SHAP values
shap_values = explainer.shap_values(X)

# Visualize single prediction
shap.waterfall_plot(
    shap.Explanation(
        values=shap_values[0],
        base_values=explainer.expected_value
    )
)
```

- DeepExplainer: Neural networks