



**COLLEGE OF ENGINEERING  
AND COMPUTER SCIENCE**  
FLORIDA ATLANTIC UNIVERSITY

Announces the Ph.D. Dissertation Defense of

## **Kuntal Thakker**

for the degree of Doctor of Philosophy (Ph.D.)

“EVALUATION OF INFLUENCES OF THE EL NIÑO-SOUTHERN OSCILLATION (ENSO) EVENTS ON CHANGES IN TEMPERATURE EXTREMES AND RESIDENTIAL ENERGY CONSUMPTION IN SOUTH FLORIDA”

**July 17, 2024, 10 AM**  
**EG-36, OME Conference Room (In Person & ZOOM)**  
**777 Glades Road**  
**Boca Raton, FL**

**DEPARTMENT:**

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**ABSTRACT OF DISSERTATION**

**EVALUATION OF INFLUENCES OF THE EL NIÑO-SOUTHERN OSCILLATION (ENSO) EVENTS ON CHANGES IN TEMPERATURE EXTREMES AND RESIDENTIAL ENERGY CONSUMPTION IN SOUTH FLORIDA**

El Niño Southern Oscillation (ENSO) events throughout the world are known to influence regional (or local) hydroclimatic variability and changes in essential climatic variables (i.e., temperature, precipitation and others). Variations in temperature extremes influenced by ENSO may lead to spatial and temporal variability of energy consumption and better management strategies by energy utilities. The focus of this study is to assess the possible influences of El Niño Southern Oscillation (ENSO) events on regional temperature characteristics and extremes along with residential energy consumption in South Florida. The region of interest comprises three Counties namely Miami-Dade, Broward and Palm Beach. Evaluation of ENSO events on temperature is carried out using long-term monthly mean, minimum and maximum temperature data from 1961-2018 from several sites located in these counties. Joint variation of monthly electricity consumption obtained from a local power utility and temperature data available from the year 2001 to 2018 are used in the study. Temporal windows that coincide with three phases of ENSO (i.e., warm, cool and neutral) are used to evaluate changes in temperature and energy consumptions. Nonparametric hypothesis tests are used to confirm statistically significant changes in temperature and energy in different phases of ENSO. This study is expected to provide insights into the possible spatial and temporal influences of ENSO events on temperature and residential electricity consumption for South Florida. Preliminary results suggest that spatially non-uniform variations in temperature influenced by El Niño and La Niña events affect the residential energy consumption in South Florida. Insights gained from this study can help local power utilities to plan and manage energy production and distribution for future ENSO events. The study also explores the relationship between other climate variables like relative humidity, dew point temperature, and heat index, and their impact on energy consumption. A predictive Long Short-Term Memory (LSTM) – a type of Recurrent Neural Network (RNN) model is developed to forecast energy consumption based on the various climatological data, demonstrating a strong positive correlation. The results highlight the importance of understanding ENSO's influence on energy demand for effective resource management and planning in the face of climate variability.

Keywords: ENSO, residential energy consumption, El Niño, La Niña, climate variability, statistical analysis, Deep learning, south Florida,

#### BIOGRAPHICAL SKETCH

Born in – Vadnagar, Gujarat, India

B.S., Florida Atlantic University, Boca Raton, Florida, 2010

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#### CONCERNING PERIOD OF PREPARATION

#### & QUALIFYING EXAMINATION

**Time in Preparation: Year – 2017-2024**

**Qualifying Examination Passed: Fall 2016**

#### Published Papers:

**Evaluation of Influences of ENSO Events on Changes in Temperature Extremes and Energy Consumption in South Florida**

**By K Thakker, RSV Teegavarapu**