بسم الله الرحمن الرحيم

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تم رفع هذه الرسالة بواسطة / سلوي محمود عقل

بقسم التوثيق الإلكتروني بمركز الشبكات وتكنولوجيا المعلومات دون أدنى مسئولية عن محتوى هذه الرسالة.

ملاحظات: لا يوجد

ARTIFICIAL NEURAL NETWORKS BASED MODELING AND OPTIMIZATION OF THERMOCHEMICAL CONVERSION OF BIOMASS

By

Ahmed Abdelgawad Aly Abdelgawad Mady

A Thesis Submitted to the
Faculty of Engineering at Cairo University
in Partial Fulfillment of the
Requirements for the Degree of

MASTER OF SCIENCE

In

Chemical Engineering

FACULTY OF ENGINEERING, CAIRO UNIVERSITY
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Title of Thesis:

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Key Words:

Deep learning, Machine learning, Combustion, Pyrolysis, Gasification.

Summary:

Biomass is considered one of the most promising and feasible renewable energy sources. Over time, the exploitation of biomass feedstock for various industries has been grown significantly. Most experimental techniques, however, require equipment that is extremely complex and costly. In this research, a novel approach aiming to predict the most desirable outputs of different biomass thermochemical conversion processes has been adopted.

The main goal of this study is to utilize the machine learning techniques specifically deep learning in the field of biomass energy recovery through the development of artificial neural network models that can predict the higher heating value of biomass feedstock, lower heating value of gasification product, bio-oil and bio-char weight percentages for fast and slow pyrolysis respectively. The main input parameters used are obtained using both proximate and ultimate analysis as well as operating conditions for gasification and pyrolysis. This study also introduces deep learning aside with optimization as a magic tool for identifying different biomass feedstock that have a high potentiality for further processing technology or investigation.

Disclaimer

I hereby declare that this thesis is my own original work and that no part of it has been submitted for a degree qualification at any other university or institute.

I further declare that I have appropriately acknowledged all sources used and have cited them in the references section.

Name: Ahmed Abdelgawad Aly Abdelgawad Mady   Date: /   /2022

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Dedication

I would like to dedicate this thesis with sincere gratitude to my parents for their love, support and encouragement throughout my life. I would also like to dedicate this message to my dear sisters and colleagues who have always stood by me and supported me.

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*Last but not least, I would like to say that I am completely indebted to my family whose estimation to me grows over time. Their unconditional love, continuous encouragement and unbelievable faith in me made me go up quickly every time I fall on my back. **My family** made me realize the blessing of having people in your life who share your moments of success, but more importantly your moments of depression. Honestly, I would like to say If it weren't for my family, I would have given up on the first obstacle in this long journey.*

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Nomenclature

AI	Artificial Intelligence
ANN	Artificial neural network
C	Carbon
ER	Equivalence ratio
FC	Fixed carbon
H	Hydrogen
HHV	Higher heating value
HR	Heating rate
MSW	Municipal solid waste
N	Nitrogen
O	Oxygen
PS	Particle size
S	Sulfur
T	Temperature
VM	Volatile matter