

Kai-Chieh (Kevin) Hsu

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Research Interests

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|--------------------------|---|
| Signal Processing | ON ANTENNA ARRAY FOR APPLICATIONS OF 5G MOBILE COMMUNICATIONS AND COGNITIVE RADIO |
| Machine Learning | ON DATA CLASSIFICATION WITH LOW COMPUTATIONAL COMPLEXITY |
| VLSI design | ON DIGITAL SIGNAL PROCESSING |

Education

National Taiwan University (NTU)

Taipei, Taiwan

B.S. IN DEPARTMENT OF ELECTRICAL ENGINEERING

SEP. 2014 - PRESENT

- ACHIEVED 4.19/4.3 OVERALL GPA AND 4.2/4.3 MAJOR GPA.
- HARDWARE COURSES: COMPUTER ARCHITECTURE(A+), ADVANCED INTEGRATED CIRCUIT DESIGN(A+) AND DIGITAL CIRCUIT LAB(A+)
- COMMUNICATION COURSES: PRINCIPLES OF COMMUNICATIONS(A), ADVANCED DIGITAL SIGNAL PROCESSING(A+), INTRODUCTION TO WIRELESS AND MOBILE NETWORKING(A+) AND RF MICROWAVE WIRELESS SYSTEMS(A+)
- MACHINE LEARNING COURSES: MACHINE LEARNING(A+) AND MATHEMATICAL PRINCIPLES OF MACHINE LEARNING(A+)

Research Experiences

ECG Real-Time Telemonitoring

Taipei, Taiwan

UNDER PROF. AN-YEU (ANDY) WU, ACCESS LAB

AUG. 2017 - PRESENT

- PROPOSED COMPRESSED ANALYSIS (CA) TO CONDUCT REAL-TIME ECG TELEMONITORING AND CONSIDERED FOLLOWING IMPROVEMENTS
- EDGE CLASSIFICATION: INCORPORATED COMPRESSED SENSING (CS), TASK-DRIVEN DICTIONARY LEARNING (PREDICTIVE SPARSE CODING) AND PCA TO RENDER LIGHT-WEIGHTED CLASSIFIER AND OVERCOME LIMITED LABELED DATA CHALLENGE
- ON-DEMAND RECOVERY: ...
- HARDWARE DESIGN AND CHIP IMPLEMENTATION: ...

Direction-Of-Arrival Estimation

Taipei, Taiwan

UNDER PROF. JEAN-FU KIANG, GROUP OF ELECTROMAGNETIC APPLICATIONS

FEB. 2017 - PRESENT

- APPLIED DIFFERENT METHODS TO ADDRESS ENTAILED PROBLEMS OF DIRECTION-OF-ARRIVAL (DOA) ESTIMATION
- ANTENNA UNCERTAINTY: UTILIZED SPECIAL MATRIX STRUCTURE WITH KHATRI-RAO SUBSPACE-BASED MULTIPLE SIGNAL CLASSIFICATION ALGORITHM TO IMPROVE IMMUNITY TO UNCERTAINTIES AND DETECT DOAs WITH SENSORS HALF THE NUMBER OF SOURCES
- MORE SOURCES THAN SENSORS: PROPOSED A NEW ANTENNA ARRAY STRUCTURE TO INCREASE THE DETECTABLE NUMBER OF SOURCES BASED ON FOURTH-ORDER STATISTICS AND COMPRESSIVE SENSING APPROACH
- MIXED CARRIER FREQUENCY (CF) KNOWN AND UNKNOWN SOURCES: PROPOSED A TWO-STEP ALGORITHM TO FIRST ESTIMATE DOA OF KNOWN SOURCES AND THEN JOINT ESTIMATE THE DOA AND CF OF UNKNOWN SOURCES

Publications

Low-Complexity Compressed Analysis in Eigenspace with Limited Labeled Data for Real-Time Electrocardiography Telemonitoring

Anaheim, USA

K.-C. HSU AND B.-H. CHO, C.-Y. CHOU AND A.-Y. (ANDY) WU

NOV. 2018

IEEE GLOBAL CONFERENCE ON SIGNAL AND INFORMATION PROCESSING

Joint Estimation of DOA and Carrier Frequency Based on Coprime Arrays

Toyama, Japan

K.-C. HSU AND J.-F. KIANG

AUG. 2018

PROGRESS IN ELECTROMAGNETICS RESEARCH SYMPOSIUM

DOA Estimation With Triply Primed Arrays Based on Fourth-Order Statistics

Boston, USA

K.-C. HSU AND J.-F. KIANG

JUL. 2018

IEEE AP-S SYMPOSIUM ON ANTENNAS AND PROPAGATION AND USNC-URSI RADIO SCIENCE MEETING

DOA Estimation Using Triply Primed Arrays Based on Fourth-Order Statistics | [PDF]

Cambridge, USA

K.-C. HSU AND J.-F. KIANG

MAR. 2018

PROGRESS IN ELECTROMAGNETICS RESEARCH M, VOL. 67, PP. 55-64

DOA estimation of quasi-stationary signals using a partly-calibrated uniform linear array with fewer sensors than sources | [PDF]

Cambridge, USA

K.-C. HSU AND J.-F. KIANG

JAN. 2018

PROGRESS IN ELECTROMAGNETICS RESEARCH M, VOL. 63, PP. 185-193

Honors & Awards

3rd Prize IN INTEGRATED CIRCUIT DESIGN CONTEST AWARD

Ministry of Education, Taiwan

- OUT OF ABOUT 300 TEAMS

JUL. 2018

2nd Prize IN TAIWAN CREATIVE ELECTROMAGNETIC IMPLEMENTATION COMPETITION

High-speed RF and mm-Wave Tech. Cneter, NTU

- IMPLEMENTED AN ELECTROMAGNETIC STRUCTURE LONGER THAN 2.5 METERS OPERATED AT 3 GHz WITH ONLY MATERIALS AVAILABLE IN STATIONERY SHOP TO ACHIEVE -7.8 DB INSERTION LOSS

AUG. 2017

8th place IN DATA STRUCTURE AND PROGRAMMING CONTEST.

Cadence, Taiwan

- OUT OF ABOUT 250 STUDENTS

MAR. 2017

Professor Chun-Hsiung Chen Scholarship

Electromagnetic Industry-Academia Consortium, Taiwan

- REWARDED OUTSTANDING PERFORMANCES IN ELECTROMAGNETIC FIELDS

NOV. 2017

Presidential Awards × 2

Dept. of EE, NTU

- GIVEN TO TOP TEN STUDENTS OF THAT SEMESTER

SECOND SEMESTER OF 2014 AND 2016

Selected Course Projects

Pipelined MIPS CPU | [PDF]

Computer Architecture

VERILOG, TEAM PROJECT

JUN. 2017

- CONTRIBUTION: SERVED AS LEADER TO DISTRIBUTE WORK, DESIGN WHOLE STRUCTURE AND IMPLEMENT BASIC FUNCTION OF CPU
- IMPLEMENTED A SYNTHESIZABLE PIPELINED MIPS CPU OVERCOMING DATA HAZARD, LW-USE HAZARD AND BRANCH HAZARD
- ADVANCED WITH BRANCH PREDICTION, L2 CACHE AND SUPPORT MULTIPLY AND DIVIDE INSTRUCTIONS

Different Handover Policies in Different Environments | [PDF]

Intro. to Wireless and Mobile Networking

MATLAB, TEAM PROJECT

JUN. 2017

- CONTRIBUTION: SERVED AS PROJECT SPEAKER, CONDUCTED SIMULATIONS AND ANALYZED RESULTS
- PROPOSED FOUR DIFFERENT HANDOVER POLICIES AND COMPARE PERFORMANCES AMONG DIFFERENT ENVIRONMENTS IN BOTH UPLINK AND DOWNLINK CASES

Drivendata Contest(Pump it Up: Data Mining the Water Table) | [PDF]

Machine Learning

PYTHON, TEAM PROJECT

JUN. 2017

- CONTRIBUTION: PREPROCESSED DATA SUCH AS CORRECTING MISSED OR ERRONEOUS DATA AND ENCODING DISCRETE DATA IN ONE-HOT
- COMPARED PERFORMANCES BETWEEN RANDOM FOREST, EXTREME GRADIENT BOOSTING (XGBOOST) AND DENSE NEURAL NETWORK (DNN)
- ANALYZED WITH HEAT MAP, CONFUSION MATRIX AND FEATURE IMPORTANCE

An Analysis of Deep Neural Networks in Hardware Perspective | [PDF]

Advanced Integrated Circuit Design

PYTHON, TEAM PROJECT

JAN. 2018

- CONTRIBUTION: SERVED AS LEADER TO DISTRIBUTE WORK AND SURVEYED THE STRUCTURE OF RESIDUAL NET, INCEPTION V4 AND XCEPTION
- REVIEWED MANY STATE-OF-ART VERY DEEP CNNs, INCLUDING ALEXNET, VGG NET, INCEPTION, RESNET AND XCEPTION
- ANALYZED WITH ESTIMATION ACCURACY AND RESOURCE CONSUMPTION AND PROVIDE INSIGHT OF HARDWARE-FRIENDLY DESIGNS

Survey of Dictionary Learning | [PDF]

Mathematical Principles of Machine Learning

TEAM PROJECT

JUN. 2018

- CONTRIBUTION: SERVED AS PROJECT SPEAKER AND SURVEYED ON PREDICTIVE DICTIONARY LEARNING AND SPARSE CODING OPTIMIZATION
- STUDIED COMPREHENSIVELY ON GENERALIZATION BOUND OF RECONSTRUCTIVE AND PREDICTIVE DICTIONARY LEARNING
- STUDIED DETAILEDLY ON OPTIMIZATION ALGORITHM OF RECONSTRUCTIVE AND PREDICTIVE DICTIONARY LEARNING, INCLUDING MOD, ODL, K-SVD AND TDDL
- STUDIED INFORMATIVELY ON SPARSE CODING OPTIMIZATION ALGORITHM, INCLUDING SUB-GRADIENT DESCENT, ISTA AND FISTA

Extracurricular Activity

MV Dance Club of NTU

Taipei, Taiwan

ASSOCIATE CLUB LEADER

JUL. 2015 - JUN. 2016

- GAINED EXPERTISE IN COORDINATION WITH TEAM MEMBERS, SCHOOLS AND OTHER CLUBS.
- ATTRACTED MORE THAN HUNDRED CLUB MEMBERS.
- HELD A DANCE PERFORMANCE ATTRACTING MORE THAN HUNDRED AUDIENCES.

Teaching Assistant

Taipei, Taiwan

DIGITAL SYSTEM DESIGN

FEB. 2018 - JUN. 2018