

1979 - 1981

Topic 1

definition machine
form property
class algebra
logic verification
free specification
grammar formal
programming function
language proof context
rule semantics
log operation introduced
array object complexity

Topic 2

controller process loop
plane extends
force vertical fuel structure
ring horizontal
region structure
fragment observer sign pilot
joint air engine
plant frame opening
dnna recursion coordinate
hybrid location provided

Topic 3

application item number
process input
stage energy
card caused request
simulation state
time transfer policy fuzzy
event variable operation
failure gas
control copy
design storage level
cost continuous technique
problem

Topic 4

optimal optimization
function abstract time
solving cost procedure
constraint dynamic set
algorithm
presented equation
variable general
problem
process programming point
case efficient
mathematical solution
program number decision

Topic 5

die compound blood contour
tape slide der
body sentence word position
rise surface concentration
age speaker
child piece drug root
head sample string
member segmentation sound grade

Topic 6

work volume designed application
package display
abstract record
user collection library
interactive terminal provide
computer
analysis development
management standard author format
program describes
report document version graphic

Topic 7

language material
question
rule situation search
time text content
subject
computer machine document
group view
retrieval practice
human specific
social term idea
process attempt
job task chapter
security individual development

Topic 8

operation application
feature operating unit instruction
structure machine time
language execution software
processing task
processor
memory parallel abstract
implementation programming computer compiler
microprocessor program

Topic 9

disabled intelligence neural
oil net cm roughly
centre terrain workshop challenge
illustration application
game
innovation
bus underline
audience formalism
robot petri port
interrupt
music player module
december artificial

Topic 10

sample recording
patient
automatic microcomputer
standard analysis
computer equilibrium
feature developed magnetic
control digital technique
program
device type response
output sampling
field film application single

Topic 11

training feature character
structural text
image speech learning description
surface shape
display object scene
picture frame presented
procedure technique
pattern
analysis skill
dimensional representation boundary
recognition visual classification human

Topic 12

complex processor architecture
software
machine function interface management
processing controller implementation
hardware tool
application operation
control
technique performance abstract
computer
process reliability display
modeling

Topic 13

functional module level concept
design performance logical abstract
methodology feature relational analysis
application developed presented
code specification presented
database type query discussed
technique tool operator
decision process relation
process requirement designer
structure structure

Topic 14

delay link mechanism
channel rate protocol
packet routing traffic
node service
network buffer multiple
time communication
capacity scheme queue
performance flow probability
message transmission access
distribution number

Topic 15

characteristic error
phase test technique high
stability control measure
order load estimate design
frequency output flow
function effect presented time
analysis feedback condition source
measurement power experimental

Topic 16

engineering center analysis
science office
technology year
resource area school
university computing department
cost planning
medical planning
development cost
management medical
project education
computer industry state
national future library
future service

Topic 17

element switch network
signal switching position
integrated integrated
Circuit low high
chip bit memory power
includes channel transmission
line telephone satellite
device speed
digital technology
communication current optical
vehicle control radio

Topic 18

adaptive algorithm time speech
ratio test
filter phase
frequency error bandwidth coding
spectral presented
image transform bit
fault spectrum receiver processing
noise digital performance detection

Topic 19

theorem relation sequence
graph abstract proof
point sequence
theory family class
prove element defined group matrix
order complete group formula
bound algorithm finite edge
algorithm subset problem
set polynomial vertex function
number

Topic 20

knowledge program reading
english database people
book work concept structure list
language user level
theory basic computer
problem aspect discussion
student italic question

1982 - 1984

Topic 1

algorithm abstract problem general tree property type process program matrix decision set complexity time structure procedure number transformation simple polynomial point computation order case technique search presented function linear search presented linear

Topic 2

application interactive support interface computer high requirement discussed developed implementation environment specification technology tool user describes technique operating design communication level software hardware graphic engineering

Topic 3

heart protein acid molecular preprocessing film biological optic patient tumor muscle fiber region blood gene of sequence drug chemical number compound residue site

Topic 4

experiment sequence sound frequency cell term correct analysis algorithm relaxation presented analysis response order representation distance correction transient experimental error child entropy stimulus domain threshold

Topic 5

game analysis discussion net key phrase curriculum belief theory strategy sentence issue engineer catalog reliability work request failure fault goal learning lisp tolerant record prototype

Topic 6

time ratio high adaptive signal technique error characteristic low case frequency sampling digital power noise function quality performance measurement effect

Topic 7

processing space version spatial analysis motion object edge pixel resolution coordinate point scene color display visual dimensional region surface representation boundary image shape map feature technique pattern vision picture abstract

Topic 8

logic time measurement power automaton layout circuit vlsi column lower simulator chip ic cmos velocity layer test estimator size gate technique bound delay simulation constant lsi grammar

Topic 9

solving number distribution nonlinear solution state dynamic time numerical algorithm control condition constraint general approximation heuristic function process optimal feedback equation theory stochastic presented finite

Topic 10

control engine speed application magnetic time point chapter input output current limitation material temperature device field sensor automatic design circuit element high optical robot switch switching

Topic 11

event individual process framework concept structure inference human graph relationship plan problem understanding chapter hypothesis vertex number time knowledge expert group mechanism variable domain representation

Topic 12

processing traffic level array access control algorithm cost design communication processor memory distributed architecture network parallel operation time flow problem application

Topic 13

Topic 14

definition structure property element
rule relational query theory functional theorem
database defined string subset theorem
function sequence number type abstract called
database logic language integer proof
set subset number type abstract called
number logic language integer proof
type logic language integer proof
language logic language integer proof
class program attribute form relation

Topic 15

The word cloud is centered around the word "analysis". Other prominent words include "factor", "statistic", "application", "problem", "testing", "parameter", "methodology", "bvector", "decision", "simulation", "estimate", "sample", "mathematical", "test", "statistical", "process", "technique", "level", "procedure", "distribution", "presented", "modeling", "evaluation", "measure", "development", "measurement", "classification", and "estimation". The words are colored in various shades of green, blue, and yellow.

Topic 16

library

technology

service

user

development

Topic 17

phase mobile clock
antennalink italic
bit element binary
beam wave
channel
carrier communication length
minimum pulse
Signal
path distortion shift
optical time receiver
plane rate source
rate frequency
code
transmission

Topic 18

Speech recognition pressure unit arm block body movement speed frame rate water test letter gas spl position motor device time vehicle ram vocabulary control connected includes dialogue

Topic 19

language

computer user storage
machine
abstract
problem generation
syntax
programming
structure type program
time text
general compiler code
processing pascal description
database
translation semantic
implementation application

Topic 20

assembly component
memory module
type instruction cpu
dictionary processing radar display
target bit mode eye
movement control
operation speed time device
card unit head position signal
arithmetic machine

1985 - 1987

Topic 1

performance simulation correlation developed
experimental characteristic flow range
measure interference difference process
measurement effect energy compared time game response
phase condition presented experiment region
technique rate velocity measured potential
analysis

Topic 2

processing graphic device
program array layout
chip cell computer high
vlsi presented technique
image display speed
technology input level digital
design circuit performance
algorithm implementation function

Topic 3

logic abstract class
function semantics formal
language prolog term
proof programming order grammar
theory net concept set
type program extension definition
specification structure free form rule
algebra defined theorem

Topic 4

object abstract dynamic
optimal dimensional state
linear class tree
point algorithm
set structure constraint
order time control
matrix number space
edge graph
presented adaptive technique controller
problem solution

Topic 5

power pressure mode
laser surface element
temperature vehicle contact
detector beam body side speed
includes engine provided
Control device position motor
beam pulse head movement operation drive field
body side speed
force high

Topic 6

item time form polygon map
time digit element
code vector quantization
subscript space weak number
supscript number decoding
italic film rate correcting
point length binary error patch normal encoding

Topic 7

environment simulator site support
oriented view program validation
database structure tool dynamic
user evaluation language
simulation prototype command
test mechanism performance
object attribute interpretation
simulation management implementation

Topic 8

family upper group
complexity graph counting relation
bound apl number
box covering weight track pair
size permutation symmetric connected
de time log
lower set case
neuron member region

Topic 9

transmission satellite queue delay
area curve protocol channel
link access switching radio
local node voice optical performance
packet rate time traffic
surface service routing
network communication

Topic 10

design artificial natural theory description
intelligence human relation
domain interpretation
knowledge rule reasoning
representation relationship technique
understanding inference level
expert ai structure task language
process problem framework application

Topic 11

plan imaging high dna
imaging trace diagnosis
fault video industrial
tolerant real laboratory
visual cray failure
sensor computer monitoring
robot tolerance
event detection planning
variety recovery time
player camera level

Topic 12

drawing decided alarm
ing cf y
con answer investigating
te journal
pm left st history
state false note
false john latest
question bibliography tion

Topic 13

A word cloud diagram illustrating concepts related to education and research. The words are arranged in a cluster, with larger words representing more prominent themes. The words include: service, computer, material, collection, development, area, medical, field, science, public, school, reading, people, library, online, teacher, technology, scientific, student, book, year, file, survey, national, group, university, computing, article, work, educational.

Topic 16

computer training
development work
document writing
language report
concept version
problem chapter
review environment
experience program
standard programming
text abstract issue
student analysis
learning management
author task book
project organization

Topic 19

structure window lisp
recognition
programming classification
list pattern table
function feature level neural
speech
set unit search
language sequence technique
expression speaker
input program type
file memory character

Topic 14

algorithm distribution test factor
error technique reliability number
accuracy assumption case time estimate size
case performance random sample
analysis variable transform
procedure value function estimation prediction
parameter simulation statistical
probability coefficient

Topic 17

development program abstract support tool
interactive specification
specification
component hardware
designer
application control environment language
language
user package product module developed
interface engineering project process
software analysis requirement graphic

Topic 20

hardware computer execution number computing high multiprocessor time algorithm operation application architecture performance program process implementation distributed task processor control computation problem level machine message network

Topic 15

distributed potential
patient choice
alternative case
making demand
cost policy
transaction optimal hospital
decision
objective database
concurrency query
strategy solution
criterion network
process problem
utility agent scheme
evaluation action

Topic 18

signal **noise** **filter** **frequency** **circuit**

clock power digital channel high bit time current CMOS sampling response spectrum analog input band operation low voltage function

component delay output

Topic 15

Topic 18

distributed potential patient alternative heuristic
choice case making demand
cost policy
transaction optimal hospital
decision
objective database concurrency query
strategy criterion solution
process utility problem network
utility agent scheme action
evaluation

noise function voltage
delay low
output band switch
clock operation sampling
filter signal frequency
power digital input spectrum
component channel analog response
filter gate phase cmos
high bit time current

filter **signal** **frequency** **circuit**

1988 - 1990

Topic 1

gene compression sar tion ensemble
compression sensing diffusion
con gi le deal ing
virus remote authentication
index lambda
radar tape
signature satellite
air height blood
height la

Topic 2

event private case catalog
serial control sharing user
product production decision
copy manufacturing customer
state service qualitative
process cost
organization work standard number server
transaction site failure operation

Topic 3

efficient lower computation
time complexity
size find search
problem equation parallel bound
log solution linear cost
processor polynomial case
number finding matrix
computing optimal tree solving
scheduling

Topic 4

joint controller stability tree trajectory
control problem path space
graph manipulator structure
state nonlinear
force dynamic algorithm vertex
feedback sensor presented time parameter
equation robot motion
degree edge linear

Topic 5

antenna test cmos
circuit current electrical
array design technology beam
element optical chip field
power speed gate
transistor mu device mode
voltage etx cell low
analog logic
wave switch

Topic 6

developed testing decision
analysis application constraint level
designed optimization
presented test
problem solution structure tool
italic strategy process discussed fault
methodology implementation

Topic 7

access architecture packet
channel etx time learning
performance transmission protocol
local message routing
node layer neuron number
service neural simulation
cache communication
interconnection link
network delay
connection traffic presented

Topic 8

computation programming
architecture communication environment
processor representation operation
memory object mechanism level
parallel machine expert
knowledge process distributed
task language execution
rule processing implementation

Topic 9

project management
design integrated
tool support
discussed interface
technology engineering
application communication
computer process
development requirement area
service quality control expert
environment computing issue
future network user

Topic 10

teacher knowledge theory
Computer teaching activity decision
development subject university
student role
experience strategy human science medical
learning process group
education issue year task
problem work
practice training skills school

Topic 11

structure development
description formal concept
specification abstract graphical
software knowledge design
user relational
tool support oriented
language attribute document
database environment rule
query retrieval definition
interface representation

Topic 12

case relation defined
abstract form
order general number
set classification proof formula
theory term logic
property theorem representation variable
function called
type notion finite
class space class
net structure pattern

Topic 13

material computer question work report reader science topic list people program book writing good collection year university reading chapter publication online library reference subject article

Topic 14

probability detection rate error estimation compared measure time estimate parameter test vector procedure quality prediction technique coding performance measurement sample statistical experiment accuracy etx distribution factor

Topic 15

presented performance input order output rate digital adaptive response phase bit filter error algorithm receiver signal channel time noise high function delay block technique

Topic 16

priority machine semantics state string event behavior fortran written automation execution simulation temporal ada analysis verification sorting trace logic prolog compiler calculus real time timing queue programming

Topic 17

board control disk test package workstation set operation user module pc machine file unit display software standard computer developed ibm hardware storage operating memory code time graphic interface designed

Topic 18

defect group material temperature comprising provided mounted portion connected pressure head utility inspection body mechanism surface position movement member frame wheel comprises profile vehicle safety elements side apparatus

Topic 19

region point shape map camera sequence target color vision feature resolution motion surface boundary processing scene space algorithm field technique presented edge pixel visual image spatial dimensional etx

Topic 20

vocabulary clause context text final pattern linguistic feature input recognition dictionary translation grammar semantic speaker unification syntactic word parser sentence rule english version natural language prolog character parsing analysis

1991 - 1993

Topic 1

recording source antenna
measurement resolution range
laser beam material magnetic
area field color optical cm
fuzzy beam wave
radar cell video screen
calibration cell high measured light film
target medium measured film

Topic 2

high message channel
transmission load
communication routing
distributed multiple node
failure fault
protocol control number
simulation traffic scheme
service architecture station
delay packet time
etx link access application
network performance

Topic 3

neuron biological rom
biological market organisation
disk man history bar
computer artificial tutoring european
chinese discovery innovation web area
SOCIAL human nuclear dialogue heat
chemical physical brain

Topic 4

structure object
process relational
database domain search reasoning
query context learning
representation processing task
language retrieval
knowledge text semantic
document concept set
expert relationship pattern problem
classification classification problem

Topic 5

position edge
control point etx
region vision
3d joint
real
feature
image
shape
processing
object force
point
manipulator
surface
feature
pixel
technique
robot
sensor
space
dimensional
motion
object
space
presented
field
robot
sensor
scene
dimensional
motion

Topic 6

diagnosis behaviour
agent problem
trial monitoring
problem animation
situation
event patient dynamical
making diagnostic
action music
discrete track
decision preference
behavior copy ordinary
simulation permission
event patient making
action discrete track
behavior ordinary
simulation permission
event patient making
action music
discrete track

Topic 7

estimation simulation error
parameter analysis numerical
algorithm problem numerical
adaptive scheme stability filter
adaptive etx
adaptive dynamic
control equation estimate
controller time nonlinear
state linear condition
linear

Topic 8

connected purpose
member frame support
provided group point
body number
vehicle intersection apparatus
device side portion unit
position element plurality
plane copyright
version flow

Topic 9

frame quantization feature
speaker image technique
quality scheme
recognition vector rate
source transform
sequence code
bit symbol
pattern video
picture wavelet
speech coding
block encoding
segment pattern word
compression visual

Topic 10

digital processing module
processor time chip output power
array design current input
speed operation device etx
circuit analog implementation
architecture signal performance hardware
memory cell test level high
test parallel

Topic 11

online record workstation resource
access library protocol
transaction group service
user internet computer unix
file management environment format
key application computing remote
support distributed
client standard operating server

Topic 12

sequence calculation
assembly dimensional
length chain site
product mesh quasi fitting
map element solid
error protein label
matrix block correction
regular structure

Topic 13

project group
problem test development question
student
article year writing
learning reading technical
teaching
computer
book issue teacher library
program material school report
technology
university subject
document education

Topic 14

point set solution
bound graph function
search space problem
complexity efficient optimal tree
number node log size case optimization
algorithm parallel linear learning
neural time class path training
network

Topic 15

developed implementation methodology level
application analysis development component technique
software support language
design programming requirement engineering problem
user interface environment structure
object tool concept oriented process modeling computer specification

Topic 16

phase filter order
analysis time sample
frequency
input power detection
digital performance distribution
signal
spectral transform function
band response output
error rate etx
noise
correlation algorithm channel probability

Topic 17

calculus function problem
general chapter abstract
notion semantics finite
logic
type theorem operator extension
language
theory
relation algebra proof
constraint class term structure
formula form order property italic
set

Topic 18

potential muscle region
alpha cut counting cell
particle type card
surface expression
string
em free phrase phenomenon
optical head positive current
grammar profile layer movement
movement stress parsing negative atom electrode

Topic 19

decision game factor priority measure
task scheduling cost quality
analysis cost risk case
time
real process strategy
schedule number production
resource metric evaluation

Topic 20

structure memory transformation
distributed language dependency
processor synchronization state
execution petri code shared
compiler implementation performance
parallel
sequential net machine
multiprocessor computation
program
concurrent analysis
parallelism time technique

1994 - 1996

Topic 1

component implementation management
application communication query
structure language user process
framework retrieval
protocol class specification
support requirement design
level control oriented architecture environment
database programming interface
distributed net

Topic 2

computer
topic practice
material business educational reading process
science teacher year
learning
university text
student
group subject
language
education
school author

Topic 3

number signal high ratio
digital cache
scheme or
video quality
rate error
coding multiple
algorithm bit
block noise
sequence frequency
memory vector code
time channel
low encoding cdma compression

Topic 4

computer service issue electronic
quality resource support organization
management library future
development cost web provide
multimedia standard user communication
project network wide area problem medium
work application area access
technology internet

Topic 5

platform report version performance environment development work parallel virtual laboratory computing application package user developed library product computer interface program implementation tool process standard code engineering project programming workstation

Topic 6

cost control optimal
time neural training
search strategy dynamic
solution parallel
genetic problem fuzzy
algorithm performance
adaptive technique
scheme optimization learning
input scheduling number task
network processor presented
function controller

Topic 7

procedure condition order
process time nonlinear
technique response problem
equation measure
analysis presented
performance modeling case
parameter variable estimation
numerical control
simulation estimate solution measurement
dynamic state error
distribution statistical

Topic 8

text set language visual
speaker word
map pattern animation corpus
automatic acoustic dictionary
analysis speech cd
face input form
rendering character
feature experiment
recognition representation
sound lexical human
sentence processing

Topic 9

communication connection antenna atm
signal performance transmission control buffer rate
radio bandwidth cell
protocol message
delay service mobile
station packet receiver
time call link
channel source
traffic switch
wireless

Topic 10

gear tolerant link
fault route tolerance
faulty virtually failure
safety motor
grammar network utility
connected transportation
wheel
vehicle
tribe
geog steering earth driver
satellite road spacecraft
free driving

Topic 11

environmental product counter closure c site actuator database catalog tag atom replication reaction environmental product server Client library plotsearch le programme nuclear composition Water

Topic 12

assembly portion provided
position member body motion contact velocity
joint side trajectory vehicle arm drive hand pressure flow
robot surface material human control angle direction
device movement force mechanical ring

Topic 13

record medical
reference entry java summary
key chapter internet
list patient
document collection publisher
introduction text secure
security type
table clinical book basic
appendix

Topic 14

processor game disk color
interface access command screen read
memory time computer provided stored
program window input storage
video audio output file
copy display card unit
operation operation

Topic 15

chip current clock
range noise
circuit frequency speed
g filter measurement phase
high analog energy radar input
power wave cmos device
signal low optical band voltage digital
optical

Topic 16

optimal linear filter problem algorithm
order set class size graph
complexity space log matrix tree path
size vertex bound case minimum solution
time point function structure property polynomial

Topic 17

protein site biological
auxiliary patient structure container
sequence acid eeg molecular
activity bar ii matlab panel secondary
head valve broadcasting alignment
equivalence element dna sign
gene lower unit indicator cover

Topic 18

program representation
problem order term structure expert
theory set process
reasoning formal action
knowledge semantics context constraint programming
logic decision case relation domain
rule type language framework agent concept

Topic 19

high time hardware
application analysis requirement
design generation level
visualization real task
circuit performance development
real tool technique
testing implementation set
process software processor
fault methodology simulation

Topic 20

vision motion field
region target camera
image scale scene
point detection shape presented
object matching edge
spatial processing dimensional pixel
feature real surface
technique 3d resolution visual segmentation

1997 - 1999

Topic 1

communication
call neural
queue location routing game
node scheme local number
cellular message cell
network state connection capacity random
probability mobile process
time function problem
distribution layer switch switching

Topic 2

feature hidden rule
recognition experiment measure
neural training parameter set
pattern technique automatic analysis
classification rate detection task
speech speaker character test error
learning input extraction acoustic

Topic 3

subject cost estimate
criterion selection statistical problem
number value sample regression
analysis measure case
satellite

Topic 4

real processing
parallel machine computing
architecture operation execution cache
performance technique task
application hardware processor communication
time instruction module code computer
memory programming distributed implementation
level high

Topic 5

fault heuristic circuit
problem approximation
solution constraint space
technique presented
size cost optimization time
optimization point computation
function efficient test
genetic path
algorithm vector
optimal number computational

Topic 6

dictionary lexical read
sequence file translation
retrieval indexing item corpus structure
word mining text table
verb searching list linguistic
document query content
window similarity
entry database reading collection format

Topic 7

high sensor device area
power energy optical
field range current
chip voltage surface
radar technology
Circuit supply single measured
measurement temperature test frequency

Topic 8

activity product
individual social
agent risk management
group plan process support
action health
plan multi care
work goal task
goal market organization
clinical problem making
decision project patient team

Topic 9

year language
basic teaching author
learning technology chapter
university skill
education introduction material
student teacher writing question
computer reader
topic work english school
book program article
science reference

Topic 10

feature shape map
image processing real
pixel visual
resolution scene
color point
compression face
object texture
spatial 3d
motion region
dimensional surface

Topic 11

processing sound communication
unit digital apparatus transmission
stored frame display mode card
signal input memory audio
control output stream user time
storage terminal plurality
video station recording
device

Topic 12

knowledge environment
design technique project
analysis developed testing modeling
component case engineering
framework framework problem simulation
software test quality concept
application methodology requirement
process tool methodology support
development work level product
issue

Topic 13

point condition vertex
bound algorithm general theory
log space matrix finite theorem order
prove prove case polynomial order
problem space treeset complexity solution
number edge time function abstract

Topic 14

signature prediction species dna alpha sequence cell acid
biological reaction predictor chemical growth structure sign
de predictor fractal site compound
Curve activity quantum molecule
neuron gene chaotic molecular

Topic 15

provided machine joint
utility movement mechanism side
drive arm grid control
position head element
body air element
member direction speed
contact mobile hand
vehicle surface assembly connected

Topic 16

concept database knowledge
structure framework set domain
object problem level specification
class representation order description
language program constraint
type query application theory
rule relation logic property
view programming semantics

Topic 17

loss resource qos buffer
network atm scheme routing
layer link packet rate bandwidth mechanism
traffic allocation multicast reliability
protocol ip transmission time
service quality performance delay cell

Topic 18

distributed library standard site
user virtual interface management
application business architecture
service electronic internet computer network
technology access resource mobile
web security server multimedia environment communication

Topic 19

channel power performance adaptive
signal scheme noise time presented
noise frequency parameter phase
error code estimation order
filter spl cdma receiver multiple
bit coding sequence rate technique
interference interference

Topic 20

nonlinear stability linear behavior
control environment feedback robot
state adaptive input
fuzzy parameter time plant
controller loop uncertainty output
dynamic equation learning problem
design performance condition real

2000 - 2002

Topic 1

feature resolution processing time
3d object surface point
technique pixel wavelet color
image detection scene high
video quality motion
algorithm segmentation spatial map
frame compression real camera

Topic 2

clock mode chain switch level
power input
voltage
load stage gate
low high
design analog device
speed cmos supply
circuit cost chip converter
test output technology
current consumption

Topic 3

position pressure portion
support direction
temperature compound utility
structure cell ring contact assembly
flow fluid chemical
provided body element
molecular head side
material surface
protein plate layer
mechanism device side

Topic 4

interference algorithm bit multiple
signal detection adaptive
transmission transmission technique
noise simulation scheme
estimation estimation low phase
high rate power
channel code
spl frequency receiver antenna
coding fault time
error performance filter

Topic 5

window published version
medium cover
search copy reading guide
cd time
table introduction basic
reference reader engine read
list record editing publisher
book format television
recording file author
appendix

Topic 6

parallel speed size machine disk
memory algorithm
instruction optical task
job processing priority
storage table
scheduling implementation chapter
real hardware number
processor block operation
cell architecture array

Topic 7

application link communication
resource path network access
cache routing node ip
mobile bandwidth service time
control qos delay
protocol simulation
performance algorithm wireless
scheme mechanism traffic layer

Topic 8

sample pattern sequence
statistical vector cluster
recognition classifier
learning speech accuracy
distribution sound class
analysis training
classification experiment clustering
feature word
set probability prediction
performance task
measure gene

Topic 9

time controller
motor output tracking presented
network speed input
sensor adaptive parameter
feedback stability
control loop motion vehicle
simulation design
neural behavior force state
dynamic function
robot condition performance
nonlinear

Topic 10

space water
flight radar
measurement area aircraft earth
oil center ground
air developed
mass surface
land terrain condition
satellite observation
writer instrument
accuracy particle
field mission
wind environmental

Topic 11

object translation
sentence logic mining
theory machine
natural semantics sword
concept structure grammar
specification form pattern
language class rule english
text formal
programming chinese
program type diagram
character semantic

Topic 12

work domain technique case
view term question
evaluation article answer ontology
knowledge understanding problem
representation
analysis context testing
type relevant
event set theory
concept theoretical
process relationship

Topic 13

technology
 organization issue social group communication
project activity quality university
 process practice experience
student skill school apparatus mobile
computer community education teacher
learning development management
teaching year work
 business material

Topic 14

provided plurality connected
communication program card
input computer interface
unit number processing
terminal apparatus station
device receiving display message
signal memory game
control output transmission

Topic 15

graph linear space
 point prove tree bound
matrix class vertex
set structure element
algorithm general order
polynomial finite approximation
number problem complexity
property mesh time
function condition case
b0 dimensional

Topic 16

user key multimedia customer internet digital xml
service access management
server security site transaction
Web client collection commerce public
database content library application document
 query retrieval resource

Topic 17

development computer implementation task
process requirement user distributed management
agent concept technique architecture
tool agent level developed
application product component
software object interface technology
design framework modeling virtual
 environment support

Topic 18

child treatment volume animal person
medical human diagnostic brain drawing care tissue awareness
patient diagnosis seat risk subject heart
health disease reading medicine normal safety

Topic 19

problem function efficient optimization
 rule number algorithm analysis constraint cost numerical
 parameter strategy computational genetic performance
 time process optimal case search decision
 set fuzzy solve presented procedure

Topic 20

attack organism red marking doi
lade interscience cipher van http
al virus equilibrium die
film species genome film le

2003 - 2005

Topic 1

traffic packet peer service delay
ad bandwidth performance
ip scheme
network
node link path control
algorithm mechanism hoc layer
protocol scheduling simulation
load routing resource
time wireless distributed
communication qos

Topic 2

memory power station array
time interference transmit stream
cell radio compression
channel
antenna communication
code coding multiple decoding
bit processor access
block capacity signal rate
encoding processing

Topic 3

reader biometric acid
read guide cd
write compound source von
de edition voting
quantum group die
under room fusion
stroke title fingerprint writing
book
separation chemistry

Topic 4

frame motor plate drive provided
utility motion portion connected
vehicle speed satellite connected
body assembly element machine
position
member arm contact movement
side mechanism driving
control
surface device direction

Topic 5

technology object software cache
analysis process technique secure
component platform time environment
computing framework program
architecture requirement performance grid
design
tool hardware development real level
application implementation programming
modeling distributed

Topic 6

client control authentication network
mobile communication internet request
device server application call
service
message card terminal
key wireless content protocol
interface broadcast module
access security management

Topic 7

type grammar semantic logic
chinese verification term
reasoning fault english
language
knowledge translation context
property form theory
word semantics
formal fuzzy character
analysis sentence
checking rule relation
text structure

Topic 8

display processing area
input window mode operation
output plurality storage time provided
uni state
unit
device screen measurement
sensor recording location monitoring
signal
target apparatus detection
sensing includes

Topic 9

property problem complexity cost
case time variable
computation matrix
optimization general space set
algorithm
bound order structure
solution tree optimal
point graph state constraint
efficient

Topic 10

high wavelet visual face feature
scene processing technique region
algorithm imaging spatial color
image
real point shape
video recognition 3d
camera pixel resolution
segmentation dimensional map
object
dimensional motion frame

Topic 11

content text
game list
retrieval metadata type
web
user engine structure
search object
file concept
item xml
ontology source domain semantic
query
database collection language
document schema

Topic 12

factor statistical sample
compared correlation testing
criterion pattern
test
measure classification similarity
clustering experiment feature
experiment vector
performance
evaluation number
metric analysis selection
analysis cluster
technique set accuracy
comparison

Topic 13

iii alignment forecasting activity
chapter publication figure
introduction job ii
published edge
group al author
secondary stimulus period
note work time
version child
citation journal reference
response history

Topic 14

prediction **dynamic** **interaction**
decision
complex multi behavior
mining time patient
sequence rule cell
structure knowledge
agent
medicinal activity
gene planning process set tool protein
activity biological
analysis
process set tool protein
event
association making pattern

Topic 15

sound
learning
support
voice
interaction
behavior
audio
neural
task
cognitive
recognition
experiment
speaker
feature
svm
robot
action
hand
visual
learner
human
acoustic ability
classifier
representation

Topic 16

learning issue computer work education activity business science online library teaching product management quality experience resource organization design group practice concept article

Topic 17

surface numerical boundary
distribution solution dynamic dimensional
equation spectral process point
flow function time
order condition
parameter calculation element water
analysis mesh finite curve
simulation particle field linear
estimate structure

Topic 18

archive
computer
artifact
claim
animal patient
university
conference
thesis
tissue
vulnerability
email
private
institute
brain
coherence
medicine
auction
malicious
medicine
attack
absence
treatment
worm
petri mouse
chaotic
centre
behavioral
science
net

Topic 19

detection controller feedback
performance frequency signal
estimation linear rate
time error phase output adaptive
algorithm high scheme presented
filter order noise design
control input delay simulation dynamic
loop parameter

Topic 20

current cmos
analog signal speed
low mode temperature **high** spl gate
circuit switch device cell frequency
power converter digital energy
design chip consumption
voltage optical output clock
chip

2006 - 2008

Topic 1

simulation surface time parameter accuracy
environment location human movement noise sensor position range
dynamic optical target imaging high
robot motion tracking measured developed
measurement field error estimation analysis
3d simulation

Topic 2

memory tree disk key failure
size recovery structure
cell thread read tag group
diagnosis tolerance secure
number cluster dna protein
fault set protocol log
gene sequence rfid security string cache

Topic 3

search engine composition collection
internet access peer grid
user server interface schema
service management workflow transaction
query technology site retrieval
semantic web application content
document database content application

Topic 4

environment context concept
task resource provide level
application architecture interaction
object tool development user process support
ontology book chapter component knowledge issue
security behavior framework work domain
framework rule

Topic 5

university article
learning learner material
student group school class
education strategy program skill
training problem practice
question educational teaching experience
teaching computer game teacher reading
knowledge author online

Topic 6

intelligent state load
motor drive feedback controlling
loop serial air controlled
monitor operation driver speed remote
sensor designed control switch configured
controller

Topic 7

light vehicle machine plate
provided side comprises contact
surface position structure
assembly positioning direction element
surface device angle
member body head pressure
force mechanism frame arranged
frame material support

Topic 8

communication protocol resource
packet transmission qos
network connection application management
mobile device access request
service traffic ip
wireless user station
message internet control

Topic 9

frame chinese speaker stream
music audio rate
character graphic
tv streaming animation mode
multimedia digital standard
speech recognition
medium sound
video content item

Topic 10

project product issue
process risk industry factor
development engineering enterprise
evaluation business software
quality practice customer
management market impact
technology design future
analysis tool methodology
case work decision

Topic 11

processing plurality memory
unit apparatus interface
display signal key card file
device receiving electronic storage
module user operation output
terminal includes

Topic 12

corpus form
lexical road vocabulary
phrase translation
grammar syntactic
sentence city word
text structure relation
dictionary linguistic category
satellite term english
language urban semantic land
analysis uml meaning

Topic 13

temperature
power
low high current
chip integrated area battery
technology water consumption bus
energy speed cmos
circuit gate device digital
voltage design supply converter

Topic 14

processing platform analysis
application architecture test
tool level real processor
time hardware
technique dynamic algorithm
task testing code problem
software algorithm
design implementation high
scheduling parallel computing
performance program simulation

Topic 15

vector spatial
algorithm map
mining pattern object space
clustering experimental segmentation
image set accuracy
analysis classifier detection
classification experiment technique
feature 3d real color point high
face performance recognition region

Topic 16

decoder title group
error mol blind ring
structure angle encoding
coding crystal compound
code hydrogen
block coded molecular
bit intra length binary
inter sequence source decoding
atom bond

Topic 17

individual brain age
social state area
health conference computer
disease journal cognitive
treatment clinical year
biological workshop people
group net
human journal
activity community
science subject care

Topic 18

graph matrix case condition
problem optimization set
function number constraint
algorithm variable state equation
fuzzy solution nonlinear parameter
space class order time theory dynamic

Topic 19

channel energy
error multiple time
number compared technique
delay sensor rate
routing path transmission
algorithm capacity power
simulation node
cost complexity
performance efficient wireless
network optimal multi
problem

Topic 20

pulse timing
antenna input modulation
rf domain filtering time
phase synchronization
signal de digital
receiver spectral radio
clock gain sampling spectrum
filter channel
frequency output ofdm carrier
transmitter

2009 - 2011

Topic 1

frequency signal channel performance transmission
antenna relay spectrum user rate capacity wireless gain receiver
simulation scheme station error carrier interference modulation multi multiple communication band

Topic 2

analysis evaluation testing fault quality
assessment factor tissue safety rate level failure risk reliability impact year indicator process
response high case time number journal conditional measure
distribution measurement

Topic 3

mobile computing architecture platform support mechanism peer management network provide
resource environment user application game grid framework server distributed virtual device

Topic 4

community library technology development management business project social
knowledge industry issue website internet communication product company article organization factor market risk enterprise process online digital customer public decision year

Topic 5

software process application design analysis
work task tool computer development problem engineering web modeling domain framework structure case concept provide knowledge specific user chapter developed level techniques support

Topic 6

image object pixel motion
surface point region dimensional view 3d scene camera resolution map space processing color shape visual segmentation tracking sensor field real detection

Topic 7

activity visual brain robot human interaction
rfid potential water perception depth spatial temporal task movement eye participant behavior experiment effect subject road sound

Topic 8

energy high circuit power voltage
cmos supply chip optical pulse current gene frequency converter technology phase range design clock digital signal consumption low output temperature simulation

Topic 9

network protocol node security energy traffic wireless
mechanism packet algorithm link control layer performance communication delay attack mobile simulation problem route ad sensor topology transmission time path

Topic 10

detection experiment learning accuracy prediction error compared clustering technique adaptive analysis target set algorithm recognition neural time classifier filter feature high performance parameter noise sample experimental estimation

Topic 11

device memory storage unit communication
operation mode input user plurality receiving state request table window configuration time cell apparatus comprising processing equipment comprises terminal target control includes

Topic 12

content file video code message terminal
bit compression sequence key rate medium quality stream phone encoding

Topic 13

face

clinical imaging medicine record

treatment expression scan

blood virtual heart

ecg drug cell hospital

diagnostic adult

patient templated disease

sign facial healthcare

medical emergency diagnosis care

age

Topic 16

device motor power
provided input output
monitoring comprises operation
providing interface screen
monitoring connected
comprising module speed
unit battery arranged
structure controller position
driving signal sensor machine
driving body
controller mechanism electric
control

Topic 19

lexical
linguistic rule
speech corpus
feature vocabulary
neuron
language
chinese context
natural speaker
text fuzzy
meaning phrase
semantic
recognition word form
type
english grammar
syntax
dictionary
translation

Topic 14

A word cloud diagram centered around education and learning. The words are arranged in three main horizontal layers. The top layer includes 'university' (blue), 'music' (red), 'class' (green), 'student' (large green), 'group' (purple), 'learner' (light blue), 'child' (pink), 'science' (orange), 'education' (large green), 'writing' (yellow), 'educational' (pink), and 'material' (light blue). The middle layer includes 'learning' (large yellow), 'title' (light blue), 'computer' (green), 'compound' (pink), and 'ability' (light blue). The bottom layer includes 'ring' (red), 'book' (orange), 'course' (light blue), 'skill' (pink), 'teacher' (large blue), 'atom' (light blue), 'reading' (red), 'college' (orange), and 'training' (pink).

Topic 15

software checking subsystem
programming level
logic http java component
language transformation state
code verification implementation
program specification type
event library package
application de net execution semantics tool

Topic 17

robot order point matrix
subset function space
solving bound
numerical case
problem
parameter state genetic
theory particle number finite
algorithm
condition optimization approximation
linear optimal constraint
property

Topic 18

query pattern
mining log document vertex
number database relation
set tree sequence
similarity algorithm item
structure cluster
search path find
matching group edge label
attribute problem
graph retrieval rule
matching attribute class

Topic 20

design cost problem
multi implementation
processing architecture efficient optimization
number hardware
algorithm parallel memory
technique computational flow
application high optimal
real core processor time efficiency
processor tasks scheduling speed

2012 - 2014

Topic 1

education english material
language computer online
student skill technology training
teaching design writing
university group class reading
year teacher teacher
learning child library science
learner school activity article

Topic 2

simulation parallel processing consumption core
power level real efficiency
time low operation control cost
hardware high speed memory implementation
design dynamic task technique
performance architecture application load
energy

Topic 3

word table di arabic query mi
phrase keyword list causal da
text ranking searching dictionary
document entry die database handwritten
search top yang engine rdf character

Topic 4

simulation link number message
agent node dynamic
neural packet mechanism connectivity
protocol destination layer multi
hoc traffic route ad problem
routing topology
fuzzy network mobile communication
mobility path wireless distributed

Topic 5

delay power band user signal
radio rate network transmission
access communication channel capacity
antenna high relay receiver
wireless scheme interference simulation
performance throughput bandwidth cell
frequency spectrum multiple time

Topic 6

medicine university dr al org wearable
finger clinical article conference de
ecg figure blood record health sign
http department food author patient
surgery doi hospital vessel care international iii

Topic 7

connected controller electric
device mechanism drive provided
circuit switch position
control unit provided
driving side intelligent speed
output assembly
power driver comprises machine
body frame module arranged

Topic 8

cost provider item stream storage
trust virtual player demand
attribute video server
game policy quality application
streaming peer user qos
quality user customer recommendation
peer application qos
user customer infrastructure
cloud transaction environment
computing center resource

Topic 9

low structure light phase frequency high pressure
structure range noise
cell flow circuit element material output electrical signal field
circuit voltage surface battery panel source array
current temperature device pulse optical force

Topic 10

detection high technique
classification dataset extraction
recognition experiment classifier
image machine pattern
learning prediction sample
feature analysis segmentation tracking
algorithm face training
algoritmh accuracy clustering
vector similarity set object

Topic 11

attack encryption mobile key
online social content device
social database technique secure
application communication interface
user platform work
access scheme technology privacy
authentication provide public web digital
medium technology internet

Topic 12

camera communication interface
signal object audio processing
terminal time comprises
user device display receiving
terminal equipment file 3d
unit image mobile frame
image video screen includes



Topic 16

emergency disaster modal
biological genome pathway sequence cell expression drug
urban disease diagnosis music
quantum cancer package site tool analysis clinical specie
ontology gene molecular treatment binding structure
annotation dna

Topic 19

local point solution performance
problem cost search setquality
time solving
edge order image efficient graph
computational function
objective optimization technique optimal
number compared high
compression algorithm solve constraint multi

Topic 14

simulation resolution calibration
velocity time neural
parameter imaging field
position trajectory difference correlation
error spatial measurement signal
radar motion brain structure
accuracy structure

Topic 17

analysis interaction
language term context visual
structure domain experiment
work complex behavior
rule
semantic mining action level
concept individual time
type process activity
knowledge pattern environment
representation

Topic 15

rate failure location
detection false application
detecting area measurement
condition accuracy ip
navigation reliability
error time event
cluster lifetime real localization
monitoring sensing monitor
wireless energy Environment

Topic 18

distribution condition
problem state parameter bound random
variable space
function set probability numerical property
finite linear case error estimation
number equation solution filter nonlinear
input control optimal time order
equation matrix

Topic 20

analysis industry impact design framework engineering
technology case requirement risk
development making evaluation factor cost
management level
product methodology decision
process organization support
business tool challenge project quality
software knowledge

2015 - 2017

Topic 1

environment target
motion
space virtual map
point view shape
3d real depth
human recognition task time
object hand position
face scene video movement
camera

Topic 2

technique signature threat entity encryption
security
web authentication public
document message search file
privacy vulnerability malicious location
database user access
attack protocol device

Topic 3

computer country public net good logic food
book
digital device science
collection credit multiple cup
time inside
online people http string compatible
library university allowing

Topic 4

output input grid current generator inverter
device
operation connected electric converter
voltage circuit energy mode switching
control source load
power driving battery signal
module monitoring sensor unit

Topic 5

pada hearing ro ini dan
di artefact
translation
multimedia penelitian untuk planning
quantum humanoid sign
robotic autonomous grasping
robot verb fan dengan
animation movie yang medium
dalam

Topic 6

aerial driver notation speed coding
vehicle
real obstacle safety accident
time travel stream
video path navigation frame
inline unmanned transportation
tex engine fire
fault car detection collision
traffic road formula

Topic 7

optimal time graph structure
number case property class
bound approximation computational
set order space matrix
problem optimization state
complexity numerical solving
algorithm sample solve
math linear solution constraint

Topic 8

memory low
software program tool
design performance hardware circuit processor
application architecture high core
code technique processing test
implementation level process logic implemented parallel
block programming operation work

Topic 9

interaction chemical response
imaging eeg neuron region field function
analysis structure potential stress sample
cell resolution concentration activity musical high
brain magnetic modal sequence molecular functional biological

Topic 10

event prediction cost selection criterion factor
decision
level variable case performance risk
process
quality distribution algorithm uncertainty
time rule test value
analysis reliability set parameter evaluation

Topic 11

tissue deformation body
medical care muscle
cell gait monitoring tumor
disease healthy
registration medicine diagnosis
health hospital drugic
clinical mri diagnostic
patient heart human cancer gene

Topic 12

message medium link game thing node
agent content protocol online
mobile ad iot recommendation
internet communication community interaction
network route routing
user player people social city
behavior smart device

Topic 13

control
dynamic order
designed performance strategy
phase parameter presented
error input condition
controller linear
simulation
stability nonlinear
mode tracking adaptive
loop time state
effectiveness filter

Topic 14

algorithm
analysis
vector
network
set
clustering
classifier
feature
datasets
performance
recognition
learning
technique
training
experiment
neural
machine
image
high
art
deep
problem
detection
accuracy
task
state
dataset
classification
experimental
segmentation

Topic 15

time application algorithm efficiency
policy management environment cost
cloud solution problem framework
task access user real
service distributed performance architecture
resource real
network distributed storage device
energy computing consumption
scheduling efficient

Topic 16

A word cloud centered around the word "design". Other prominent words include "application", "process", "tool", "concept", "development", "project", "analysis", "technology", "software", and "knowledge". Smaller words surrounding these include "case", "provide", "field", "engineering", "challenge", "concept", "developed", "management", "practice", "review", "user", "product", "business", "issue", and "environment".

Topic 17

Topic 18

A word cloud diagram centered around education and learning. The words are arranged in a roughly circular pattern, with 'student' at the top center, 'learning' at the bottom center, 'education' at the bottom left, 'activity' at the bottom right, 'classroom' on the left, 'material.' on the right, 'skill' above 'learning', 'school' to the left of 'skill', 'reading' to the left of 'school', 'academic' above 'reading', 'level' to the right of 'skill', 'high' above 'level', 'group' to the right of 'student', 'grade' below 'group', 'assessment' above 'group', 'university' to the right of 'assessment', 'difference' below 'university', 'diferencia' to the right of 'difference', 'feedback' on the far left, and 'strategy' above 'feedback'.

feedback
teaching writing
strategy higher
test subject
participant class
teacher score
ability high
training
student
academic
reading school skill level
classroom material.
learning
activity education

Topic 19

frequency receiver spectrum antenna scheme technique multiple transmission
simulation energy error scheme
signal power low interference rate time
radio optical wireless
channel measurement communication
network band
sensor noise performance high
sensing

Topic 20

water material surface

temperature aircraft body flow

heat thermal field

high force position

element pressure arm

mechanical motor gas

air box

mechanism vibration

structure assembly

angle manufacturing

velocity uav

2018 - 2020

Topic 1

condition controller control stability state error adaptive dynamic fuzzy parameter simulation time performance uncertainty

nonlinear loop algorithm tracking feedback disturbance

order estimation effectiveness filter

design event output input

Topic 2

detect secure protocol vulnerability trust malicious

technique integrity

anomaly risk threat physical

attack malware identity child user cyber attacker

authentication signature protection

vr analysis emotion defense

detection behavior

Topic 3

forecast disaster forecasting sensing change resolution

water temperature spatial area monitoring satellite

forecasting high air condition region gas remote plant environmental land thermal series temporal observation surface prediction

Topic 4

current voltage converter motor phase operation simulation design

high low device frequency

fault circuit generator

grid power load electric

battery speed dc output

Topic 5

industrial quality software process project

case industry work

test tool safety building

complex developed analysis production product

design application machine

development component material technology

manufacturing requirement simulation

Topic 6

python bug language tool se

github database project stock

open code http

library programming file tag

de source test

software developer package

analysis table usepackage

Topic 7

filter signal frequency low high rate element

numerical simulation structure

error algorithm technique

parameter ratio

noise measurement compared

equation channel flow

noise time measurement compared

scheme order phase coefficient

Topic 8

review social work support

tool process digital science human

learning user activity

knowledge development

medium decision future

experience challenge online health

student technology design

level community practice

analysis factor management

Topic 9

mobile radio communication

protocol traffic access vehicle

scheme userlink delay packet

simulation node

wireless interference

network routing multiple station

sensor performance driver number

road scenario channel rate

power transmission

Topic 10

cell group analysis tumor

cancer high drug protein

patient hospital potential heart

gene treatment diagnosis

brain ct functional

subject human imaging

medical blood eeg

clinical mri tissue activity

Topic 11

network resource performance mobile

challenge processing

application solution

computing distributed framework

internet storage

cloud platform blockchain

technology time server environment

service smart device thing

management edge architecture

Topic 12

object detection accuracy recognition

feature machine algorithm multi

network datasets segmentation art

neural training high video dataset

deep classifier problem

experiment state

image performance task

learning experimental prediction

Topic 13

tree parallel
algorithm structure
size architecture hardware
processor polynomial set
graph efficient
memory implementation complexity
operation vertex core
edge log computation path
block node number

Topic 14

augmented yang sign specie
smartphones screen display reality
mobile application
user finger drone
interaction apps ar app
visual computer
phone people virtual
video hand
device android gesture smartphone

Topic 15

agriculture cryptography
hash technique file
black public encryption
reward cipher message block
group cryptographic round
video secure al
secret reinforcement private
player food box repair
key encrypted

Topic 16

scheduling resource cluster
problem search selection
decision constraint
solution energy
real time strategy
compared number
optimization
consumption objective
optimal task multi cost
algorithm
demand efficiency solve
order

Topic 17

quantum solution state
number function provide
space approximation analysis
point casematrix property
set matrix order
agent linear theory
distribution variable
probability class structure
problem constraint
algorithm abstract framework
bound

Topic 18

optical force movement surface
object 3d light
tracking position target
sensor angle body
motion range measurement
camera localization
antenna experiment point real
robot vehicle navigation
high environment human

Topic 19

sigma dm acoustic
music inline audio
dm speaker alternative
voice latex mimo
text alpha delta
formula
mm1 notation italic
symbol rmse mu
mathtex
sound gp mu
utterance mathrm
speech emotion

Topic 20

corpus style natural
semantics sentiment english
logic document rule term
event topic character word
question context ontology sentence
language relation
domain text translation
semantic task analysis
knowledge representation type