Universidad de Concepción

11th International Workshop on Hybrid Metaheuristics

January 16-18, 2019, Facultad de Ingeniería, Universidad de Concepción, Chile.

Conference Program

v1.0

Facultad de Ingeniería — *El origen de grandes soluciones*

DIICC — Departamento de Ingeniería Informática y Ciencias de la Computación

50 Aniversario — CONICYT

Facultad de Ingeniería, Universidad de Concepción, Chile

WHAT IS HM?

The HM Workshops are intended to be an international forum for researchers in the area of design, analysis, and experimental evaluation of metaheuristics. Metaheuristics, such as simulated annealing, evolutionary algorithms, tabu search, ant colony optimization, scatter search and iterated local search, are considered state-of-the-art methods for many problems. In recent years, however, it has become evident that the concentration on a sole metaheuristic is rather restrictive. A skilled combination of concepts from different optimization techniques can provide a more efficient behavior and a higher flexibility when dealing with real-world and large-scale problems. Hybrid Metaheuristics are such techniques for optimization that combine different metaheuristics or integrate AI/OR techniques into metaheuristics. The preceding Workshops were held in Plymouth (2016), Hamburg (2014), Ischia Island (HM 2013), Vienna (HM 2010), Udine (HM 2009), Malaga (HM 2008), Dortmund (HM 2007), Gran Canaria (HM 2006), Barcelona (HM 2005), and Valencia (HM 2004).

TOPICS OF INTEREST

- Contributions solicited cover a variety of topics including but not limited to:

- Novel combinations of components from different metaheuristics

- Hybridization of metaheuristics and AI/OR techniques

- Low-level hybridization

- High-level hybridization, portfolio techniques, expert systems

- Cooperative search

- Automated parameter tuning

- Empirical and statistical comparison

- Theoretical aspects of hybridization

- Parallelization

- Software libraries

CONFERENCE COMMITTEES

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Stefan Voss, University of Hamburg, Germany

POSTERS EVALUATION COMMITTEE

GIOCo (Grupo de Investigación en Optimización Combinatorial), Universidad de Concepción, Chile.

KEYNOTE SPEAKERS

Dr. Haroldo Gambini Santos is a Professor in the Computer Science Department of Universidade Federal de Ouro Preto. He has a PhD in Computer Science from Universidade Federal Fluminense (2007). His research focuses in the development of algorithms and models for combinatorial optimization problems. In 2012, he was awarded with the first prize in the International Timetabling Competition (ITC 2011), with his team GOAL. In 2013, he was awarded with the third place in the MISTA 2013 Challenge. Since 2012 he is member of the COIN-OR Foundation Technical Leadership Committee, an entity that promotes the research and development of state-of-the art open source software for operations research.

Dr. López-Ibáñez is a lecturer in the Decision and Cognitive Sciences Research Centre at the Alliance Manchester Business School, University of Manchester, UK. He received the M.S. degree in computer science from the University of Granada, Granada, Spain, in 2004, and the Ph.D. degree from Edinburgh Napier University, U.K., in 2009. He has published 17 journal papers, 6 book chapters and 36 papers in peer-reviewed proceedings of international conferences on diverse areas such as evolutionary algorithms, ant colony optimization, multi-objective optimization, pump scheduling and various combinatorial optimization problems. His current research interests are experimental analysis and the automatic configuration and design of stochastic optimization algorithms, for single and multi-objective problems. He is the lead developer and current maintainer of the irace software package for automatic algorithm configuration (http://iridia.ulb.ac.be/irace).

Dr. Günther Raidl is Professor at the Institute of Logic and Computation, TU Wien, Vienna, Austria and member of the Algorithms and Complexity Group. He received his PhD in 1994 and completed his habilitation in Practical Computer Science in 2003 at TU Wien. In 2005 he received a professorship position for combinatorial optimization at TU Wien.

His research interests include algorithms and data structures in general and combinatorial optimization in particular, with a specific focus on metaheuristics, mathematical programming, intelligent search methods, and hybrid optimization approaches. His research work typically combines theory and practice for application areas such as scheduling, network design, transport optimization, logistics, and cutting and packing.

Günther Raidl is associate editor for the INFORMS Journal on Computing and the International Journal of Metaheuristics and at the editorial board of the Metaheuristics journal, Evolutionary Computation Journal, the Journal of Applied Metaheuristic Computing, and the Journal of Memetic Computing. He is co-founder and steering committee member of the annual European Conference on Evolutionary Computation in Combinatorial Optimization (EvoCOP). He was co-chair of the 10th Metaheuristics International Conference (MIC~2013), editor-in-chief of the 2009 Genetic and Evolutionary Computation Conference (GECCO~2009), and hosted Hybrid Metaheuristics 2010 in Vienna. Since 2016 he is faculty member of the Vienna Graduate School on Computational Optimization.

He has recently co-authored a text book on hybrid metaheuristics, (co-)edited 13 books and authored over 160 reviewed articles in journals, books, and conference proceedings. In 2012 he received the EvoStar Award for Outstanding Contributions to Evolutionary Computation. More information can be found at http://www.ac.tuwien.ac.at/raidl.

Dr. Christian Blum currently holds the permanent post of a Senior Research Scientist at the Artificial Intelligence Research Institute (IIIA) of the Spanish National Research Council (CSIC) in Bellaterra, Spain. Before that, from 2012 to 2016 he was an Ikerbasque Research Professor at the University of the Basque Country in San Sebastian, Spain. Dr. Blum obtained the PhD in Applied Sciences from the Free University of Brussels in 2004 and a Diploma (equivalent to a Masters Degree) in Mathematics from the University of Kaiserslautern, Germany, in 1998. His main research interests are in swarm intelligence techniques for optimization and control, and in the hybridization of metaheuristics with other techniques for optimization. During the last 15 years Christian has (co-)authored more than 140 publications in international journals, books, and peer-reviewed conference proceedings. In total, his work has currently received more than 10.000 citations, and his current H-index is 34 (Google Scholar). Apart from acting as area editor for the journal Computers & Operations Research (responsible for metaheuristics), he

currently is also associate editor for journals such as Theoretical Computer Science, Natural Computing and Computer Science Reviews. Moreover, he is on the editorial board of several additional journals.

Dr. Blum is frequently invited to give keynote talks, tutorials and seminars. He has given invited keynote talks, for example, at conferences such as VNS 2017, Matheuristics 2016, BeneLearn 2016, and OPTIMA 2015 (Chilean Congress on Operations Research), just to name the most recent ones. Moreover, he has given invited tutorials at conferences such as META 2014, ICARIS 2012, and GECCO 2011. Moreover, Dr. Blum has been very active in the co-organization of scientific events. He is, for example, a co-founder of the international workshop series on Hybrid Metaheuristics. Finally, during his career, Christian has won several research and supervision awards. The most prestigious award he received is the IEEE Transactions on Evolutionary Computation (IEEE TEC) Outstanding Paper Award. Concerning student supervisions, he has received an award as director of the thesis that won the first prize at the "Certamen Arquímedes" (a Spanish national competition).

KEYNOTE TALKS

T1: LARGE-SCALE ONLINE RIDE-SHARING

CHRISTIAN BLUM

Abstract: Peer-to-peer ride-sharing enables people to arrange one-time rides with their own private cars, without the involvement of professional drivers. It is a prominent collective intelligence application producing significant benefits both for individuals (reduced costs) and for the entire community (reduced pollution and traffic). Despite these very promising potential advantages, the percentage of users who currently adopt ride-sharing solutions is very low, well below the adoption rate required to achieve said benefits. One of the reasons of this insufficient engagement by the public is the lack of effective incentive policies by regulatory authorities, who are not able to estimate the costs and the benefits of a given ride-sharing adoption policy. In this work, we address these issues by (i) a novel hybrid algorithm that makes large-scale, real-time peer-to-peer ride-sharing technologically feasible; and (ii) quantifying the impact of different ride-sharing scenarios in terms of environmental benefits (i.e., reduction of CO_2 emissions, noise pollution, and traffic congestion) and quality of service for the users. Our analysis on a real-world dataset shows that major societal benefits are expected from deploying peer-to-peer ride-sharing depending on the trade-off between environmental benefits and quality of service. Results on a real-world dataset show that our approach can produce reductions up to a 70.78% in CO_2 emissions and up to 80.08% in traffic congestion.

T2: AUTOMATIC DESIGN OF HYBRID METAHEURISTICS FROM COMPONENT-WISE ALGORITHMIC FRAMEWORKS

MANUEL LOPEZ-IBAÑEZ

Abstract: There is very large number of metaheuristic algorithms, and new ones being proposed frequently. Often these algorithms are very similar in nature. Moreover, an even larger number of hybrid algorithms may be generated by combining individual metaheuristics in various ways. When proposing a new algorithm, it becomes difficult to assess if this particular combination of algorithmic components has already been proposed earlier under a different name or even if other combinations of the same components would perform even better.

The result is duplication of efforts and under-exploration of the design space. A rather different design strategy starts from a framework of algorithmic components that may be freely recombined to generate useful metaheuristics. This framework is not only able of replicating known algorithms, but also of generating novel ones. Automatic algorithm configuration methods are then applied to such frameworks to search for the best algorithm given a specific problem to be solved. This talk will discuss the principles of the automatic design approach, its practical and scientific benefits, and several notable examples.

T3: HYBRID SOLUTION APPROACHES FOR THE ALGORITHM SELECTION PROBLEM: DECISION TREES
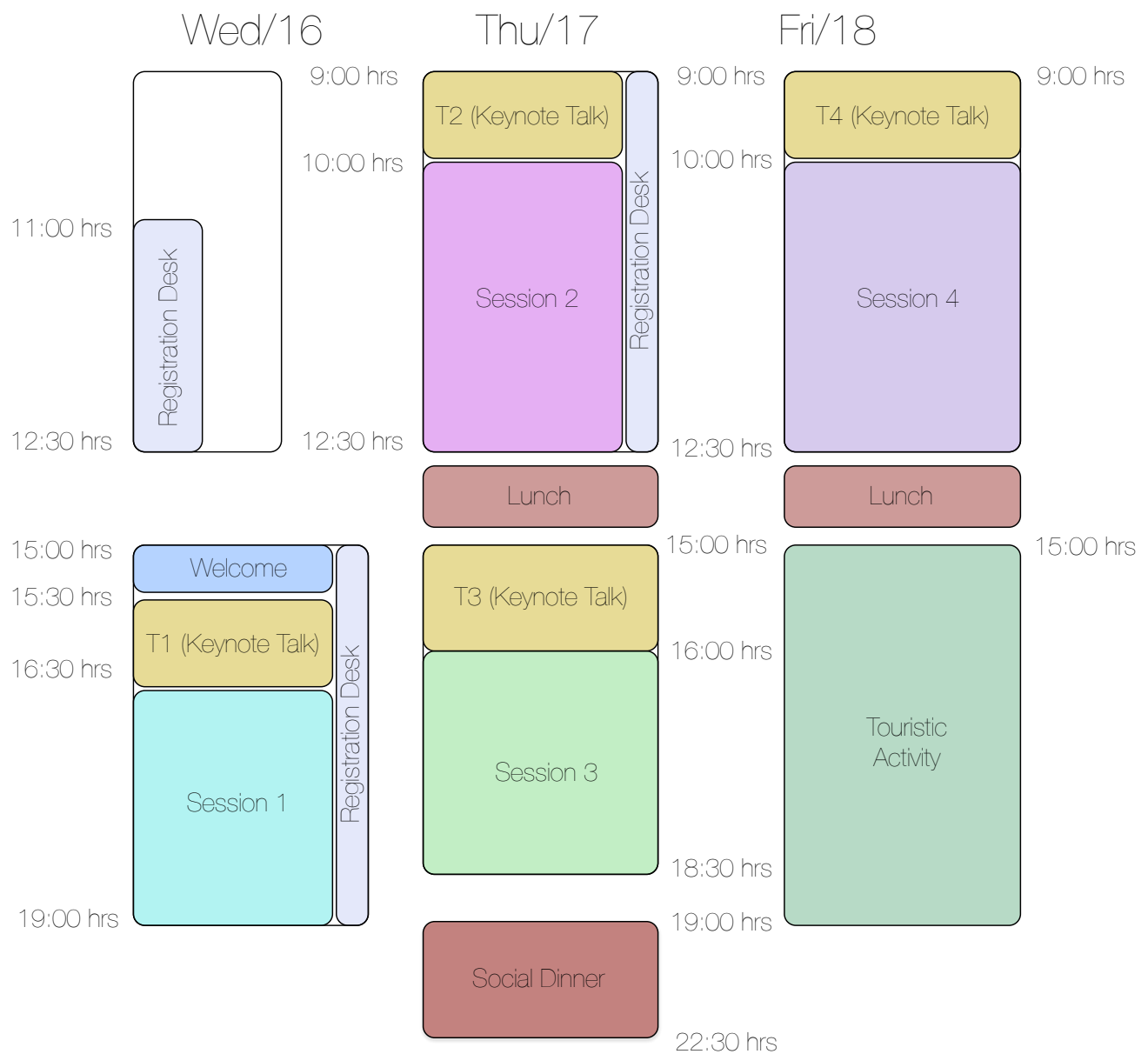
HAROLDO GAMBINI SANTOS

Abstract: Even tough it is well known that for most relevant computational problems different algorithms may perform better on different classes of problem instances, most computational experiments still focus on determining a single best algorithm configuration based on aggregate results such as the average. In this talk we present Integer Programming and Heuristic based approaches for building decision trees for the Algorithm Selection Problem. These techniques allow the automatic: (i) determination of which problem features are the most important to determine problem classes; (ii) grouping of problems into classes and (iii) selection of the best algorithm configuration for each class. To evaluate our proposal, extensive computational experiments were executed using the linear programming algorithms implemented in the COIN-OR Branch & Cut solver. Excellent results were obtained: great speedups were obtained in test datasets while evaluating the decision trees built using a separate training datasets. These results indicate that our method generalizes quite well and do not overfits, offering a robust methodology for automated algorithm selection.

T4: DECISION DIAGRAMS AND METAHEURISTICS

GÜNTHER RAIDL

Abstract: Decision diagrams (DDs) are well-known tools for modeling and verifying properties of digital systems, including electronic circuits and abstract protocols. In recent years, it was discovered that DDs are also powerful tools for discrete optimization. So far, DDs have been primarily used in conjunction with constraint programming and mathematical programming approaches, but clearly utilizing them in or together with metaheuristics also is highly promising. An exact DD closely corresponds to the state-graph of a dynamic programming formulation to a problem at hand and represents all feasible solutions by corresponding paths from a root node to a target node. A shortest (or longest) path then represents an optimal solution. For hard problems such an exact DD usually is of only limited value due to its exponential size. More interesting from a practical point of view are compact restricted and relaxed DDs. A restricted DD represents only part of the whole solution space and therefore an approximation to the original problem. We will see that a close correspondence to the well-known beam search exists. A relaxed DD, on the other hand, represents a relaxation and thus a super-set of the original problem. It is obtained by superimposing nodes of an exact DD and yields dual bounds but usually not directly a feasible solution. In this talk we will consider different methods for constructing restricted and relaxed DDs, including a novel approach based on A* search. Furthermore, we will look at different ideas to exploit relaxed DDs in order to obtain promising heuristic solutions in addition to dual bounds.

SCHEDULE

Wed/16

9:00 hrs

10:00 hrs

11:00 hrs

Registration Desk

12:30 hrs

15:00 hrs — Welcome
15:30 hrs — T1 (Keynote Talk)
16:30 hrs

Session 1

Registration Desk

19:00 hrs

Thu/17

9:00 hrs — T2 (Keynote Talk)

10:00 hrs

Session 2

Registration Desk

12:30 hrs

Lunch

15:00 hrs — T3 (Keynote Talk)

16:00 hrs

Session 3

18:30 hrs
19:00 hrs

Social Dinner

22:30 hrs

Fri/18

9:00 hrs — T4 (Keynote Talk)

10:00 hrs

Session 4

12:30 hrs

Lunch

15:00 hrs

Touristic Activity

SESSION 1

S1-1 Maximising the Net Present Value of Project Schedules using CMSA and Parallel ACO, Dhananjay Thiruvady, Christian Blum, Andreas T. Ernst.

S1-2 An Efficient Heuristic to the Traveling Salesperson Problem With Hotel Selection, Marques Moreira Sousa, Luiz Satoru Ochi, Simone de Lima Martins.

S1-3 Fixed set search applied to the traveling salesman problem, Raka Jovanovic, Milan Tuba, Stefan Voß.

S1-4 A Hybrid GRASP/VND Heuristic for the Design of Highly Reliable Networks, Mathias Bourel, Eduardo Canale, Franco Robledo, Pablo Romero, Luis Stábile.

SESSION 2

S2-1 Generic CP-Supported CMSA for Binary Integer Linear Programs, Christian Blum, Haroldo Gambini Santos

S2-2 Strategies for Iteratively Refining Layered Graph Models, Martin Riedler, Mario Ruthmair, Günther R. Raidl

S2-3 Game of Patterns and Genetic Algorithms under a comparative study, Ebert Brea.

S2-4 Stochastic Local Search Algorithms for the Direct Aperture Optimisation Problem in IMRT, Leslie Pérez Cáceres, Ignacio Araya, Denisse Soto, Guillermo Cabrera-Guerrero.

SESSION 3

S3-1 Hybridization of Stochastic Tunneling with (Quasi)-Infinite Time-Horizon Tabu Search, Kay Hamacher.

S3-2 A Self-Adaptive Differential Evolution With Fragment Insertion for the Protein Structure Prediction Problem, Renan S. Silva, Rafael Stubs Parpinelli.

S3-3 Scheduling simultaneous resources: a case study on a calibration laboratory, Roberto Tavares, Fabio Molina da Silva.

S3-4 Optimization of the velocity profile of a solar car used in the Atacama Desert, Dagoberto Cifuentes, Lorena Pradenas.

SESSION 4

S4-1 Local Search methods for the MRCPSP-energy, André Renato Villela da Silva, Luiz Satoru Ochi.

**S4-2** Adaptation of Late Acceptance Hill Climbing Algorithm for Optimizing the Office-Space Allocation Problem, Asaju La'aro Bolaji, Ikechi Michael, Peter Bamidele Shola

S4-3 Applying an Iterated Greedy Algorithm to Production Programming on Manufacturing Environment controlled by the PBC Ordering System, Fabio Molina da Silva, Roberto Tavares Neto.

S4-4 Hybrid Symbiotic Organisms Search Algorithm for Blood Assignment Problem, Prinolan Govender, Absalom E. Ezugwu.

PLANO GENERAL UNIVERSIDAD DE CONCEPCION
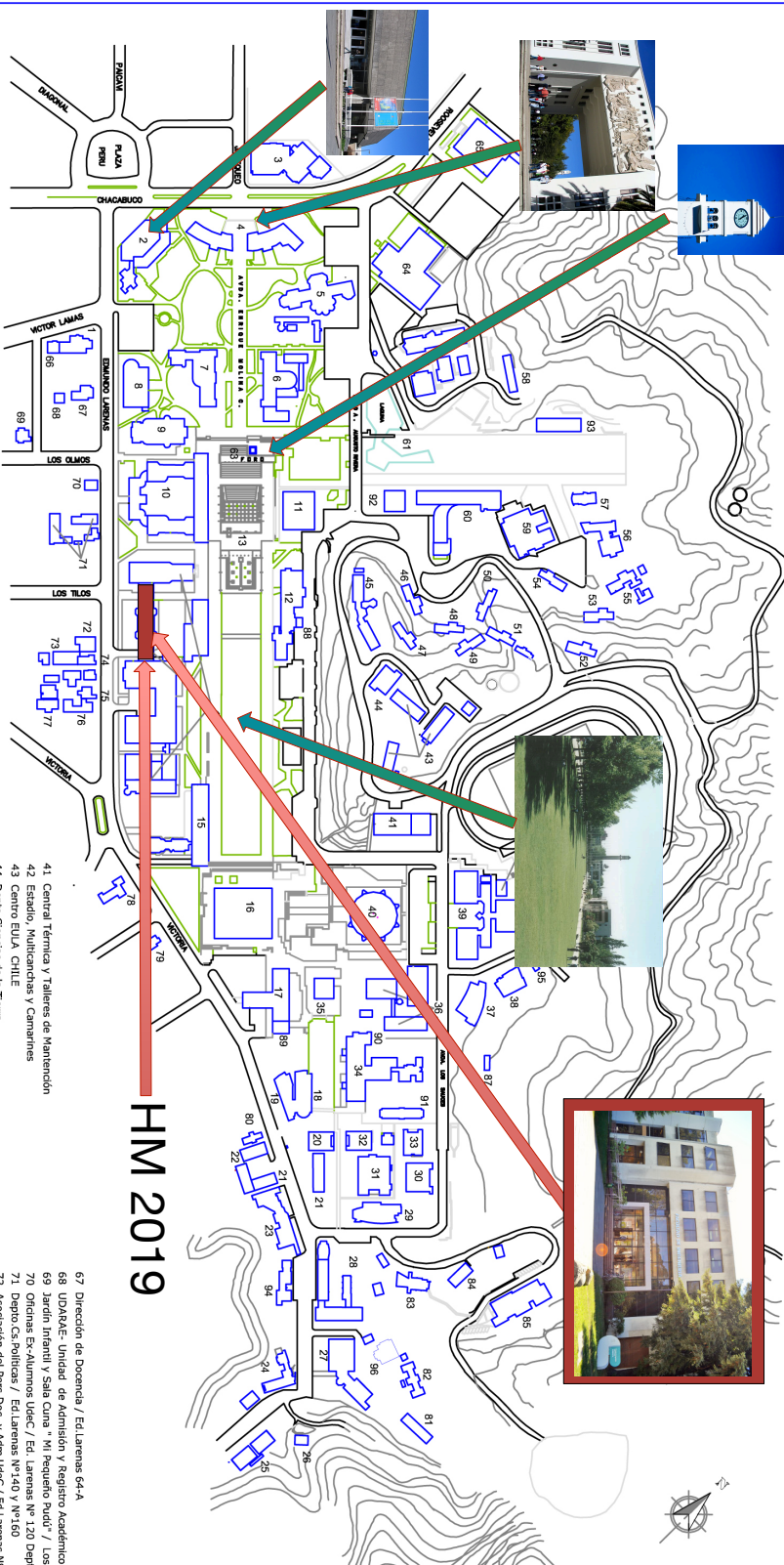
HM 2019

1 Rectoría "Casa Enrique Molina", Avda. Víctor Lamas Nº 1290
2 Casa del Arte (Pinacoteca, Extensión, Depto.Artes Plásticas)
3 Facultad de Medicina y Centro de Docencia Clínica
4 Edificio Arco Universidad de Concepción - Facultad de Cs. Biológicas
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6 Facultad de Cs.Naturales y Oceanográficas
7 Facultad de Farmacia
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10 Facultad de Cs.Químicas
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    Dirección de Finanzas, Dirección de Servicios, Dirección de Personal
13 Foro y Plaza del Estudiante
14 Facultad de Ingeniería
15 Facultad de Educación
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18 Edificio Facultad Ciencias Veterinarias
19 Edificio de Clínicas Veterinarias
20 Aulas Nº 1 (A-111/ A-112/ A-113/ A-114)
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29 Edificio Empreudec - Vicerrectoría de Investigación y Desarrollo
30 Edificio de Aulas Nº 4 (A-411/ A-412/ A-413/ A-414/ A-415/ A-416)
31 Incubadora Idea y Emprendo Incuba
32 Aulas Nº 2 (A-211/ A-212/ A-213/A-214)
33 Aulas Nº 3 (A-311/ A-312/ A-313/ A-314)
34 Facultad de Arquitectura,Geografía y Urbanismo y Aulas (A-102/
    A-103/ A-108/ A-109/ A-110/ A-201/ A-202
35 Aula 9 (A-9)
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47 Cabina 2 - Instituto GEA
48 Cabina 3 - Depto. Oceanografía
49 Cabina 4 - Red Sismológica y Museo Geológico
50 Cabina 5 - Lab. Oceanografía Química - Depto.Oceanografía
51 Cabina 6 -C I ²M A - Centro de Investigación en Matemáticas
52 Cabina 7 - Programa Regional de Oceanografía Física y Clima
53 Cabina 8- Depto. Trabajo Social
54 Cabina 9- CAPSI - Centro de Atención Psicológica
55 Cabina 10- Depto.Oceanografía
56 Edificio de Oceanografía
57 Programa de Estudio sobre la Responsabilidad Social y Talentos UdeC
58 Bodega ATT- MATPEL
59 Casino "Los Patos"
60 Facultad de Cs.Físicas y Matemáticas
61 Laguna Los Patos
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    Cafetería El Ombligo, Correos de Chile, Servicios Higiénicos
    Agencia de Viaje Campanil, Informaciones UdeC
64 Casa del Deporte
65 Facultad de Odontología
66 Contraloría Universitaria / Avda. Víctor Lamas Nº 1260

67 Dirección de Docencia / Ed.Larenas 64-A
68 UDARAE- Unidad de Admisión y Registro Académico / Ed.Larenas / 64-A Int.
69 Jardín Infantil y Sala Cuna " Mi Pequeño Pudú" / Los Olmos Nº 1221
70 Oficinas Ex-Alumnos UdeC / Ed. Larenas Nº 120 Depto. 101
71 Depto.Cs.Políticas / Ed.Larenas Nº140 y Nº160
72 Asociación del Pers.Doc. y Adm.UdeC / Ed.Larenas Nº220
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76 Depto.Materiales / Ed.Larenas Nº270
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86 Planta de Escalamiento de Biocombustibles
87 Sindicatos 1 y 3
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89 Aulas A- 10 / A-11
90 CADE - Centro de Apoyo al Desarrollo del Estudiante
91 Aulas Nº 5
92 Edificio de Astronomía
93 Edificio Docente Biología Molecular
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95 Sala de Estudios - Carrera de Agronomía
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Facultad de Ingeniería, Universidad de Concepción, Chile