

Thomas Debris-Alazard

BORN IN PARIS, FRANCE, MAY 1, 1991 · RESEARCHER SCIENTIST AT INRIA

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Research Interests

Research Area: *Public-Key Cryptography (theory, designs, cryptanalysis, standardization) with a focus on code and lattice-based cryptography*

- **Cryptographic Designs,**
- **Cryptanalysis,**
- **Security estimates,** study of the generic decoding problem
- **Security proof,** in the classical or quantum model
- **Algorithms, Reduction** classical and quantum

Employment

École Polytechnique

TEACHER ASSISTANT (CHARGÉ D'ENSEIGNEMENT)

Département d'Informatique de l'École Polytechnique (DIX)

Saclay, France

Sept. 2022 - Present

Inria Saclay

RESEARCHER SCIENTIST (CHARGÉ DE RECHERCHE)

Project-Team: Grace

Saclay, France

Sept. 2020 - Present

Royal Holloway, University of London, UK

POSTDOC IN THE INFORMATION SECURITY GROUP

Hosted by Pr Martin R. Albrecht

London, UK

Sept. 2019 - Sept. 2020

Education

Inria Paris

PH.D., CODE-BASED CRYPTOGRAPHY: NEW APPROACHES FOR DESIGN AND PROOF ; CONTRIBUTION TO

CRYPTANALYSIS

Advisor: Pr Jean-Pierre Tillich

Paris, France

Sept. 2016 - Sept. 2019

École Normale Supérieure de Cachan (ENS)

THESIS, CODE-BASED CRYPTOGRAPHY: STUDY OF A GENERIC DECODING ALGORITHM, STATISTICAL DECODING

Advisor: Pr Jean-Pierre Tillich

Paris, France

Mar. 2016 - Sept. 2016

MASTER MPRI (PARISIAN MASTER OF RESEARCH IN COMPUTER SCIENCE).

Main Topics: Cryptography, Complexity, Security reductions, Gröebner basis, Quantum algorithms

Sept. 2015 - Sept. 2016

AGRÉGATION DE MATHÉMATIQUES OPTION INFORMATIQUE.

Sept. 2014 - Sept. 2015

Honors and Awards

2021-2024 **ANR JCJ**

COLA: AN INTERFACE BETWEEN CODE AND LATTICE-BASED CRYPTOGRAPHY

200 000 €

2021 **Finalist for the Cor Baayen Young Researcher Award**

ERCIM

2020 **Gilles Kahn Thesis Award**

THOMAS DEBRIS-ALAZARD UNDER THE SUPERVISION OF JEAN-PIERRE TILlich

Société Informatique de
France

2019 **Best Paper Award, Wave: A New Family of Trapdoor One-Way Preimage Sampleable Functions Based on Codes**

THOMAS DEBRIS-ALAZARD, NICOLAS SENDRIER AND JEAN-PIERRE TILlich

Asiacrypt '19

Scientific Publications

- 2022 **Statistical Decoding 2.0: Reducing Decoding to LPN** *Asiacrypt '22*
KEVIN CARRIER, THOMAS DEBRIS-ALAZARD, CHARLES MEYER-HILFIGER AND JEAN-PIERRE TILLICH
- 2022 **On Codes and Learning with Errors over Function Fields** *Crypto '22*
MAXIME BOMBAR, ALAIN COUVREUR AND THOMAS DEBRIS-ALAZARD
- 2022 **An Algorithmic Reduction Theory for Binary Codes: LLL and more** *IEEE Information Theory '22*
THOMAS DEBRIS-ALAZARD, LÉO DUCAS AND WESSEL P.J. VAN WOERDEN
- 2021 **Classical and Quantum algorithms for generic Syndrome Decoding problems and applications to the Lee metric** *PQCrypto '21*
ANDRÉ CHAILLOUX, THOMAS DEBRIS-ALAZARD AND SIMONA ETINSKI
- 2020 **Tight and Optimal Reductions for Signatures based on Average Trapdoor Preimage Sampleable Functions and Applications to Code-Based Signatures** *PKC '20*
ANDRÉ CHAILLOUX AND THOMAS DEBRIS-ALAZARD
- 2019 **Wave: A New Family of Trapdoor One-Way Preimage Sampleable Functions Based on Codes** *Asiacrypt '19*
THOMAS DEBRIS-ALAZARD, NICOLAS SENDRIER AND JEAN-PIERRE TILLICH
- 2019 **Ternary syndrome decoding with large weights** *SAC '19*
RÉMI BRICOUT, ANDRÉ CHAILLOUX, THOMAS DEBRIS-ALAZARD AND MATTHIEU LEQUESNE
- 2018 **Two attacks on rank metric code-based schemes: Ranksign and an identity-based-encryption scheme** *Asiacrypt '18*
THOMAS DEBRIS-ALAZARD AND JEAN-PIERRE TILLICH
- 2017 **Statistical Decoding** *ISIT '17*
THOMAS DEBRIS-ALAZARD AND JEAN-PIERRE TILLICH

Preprints

- 2022 **On the pseudorandomness of the decoding problem via the Oracle Comparison Problem** *iacr.org*
MAXIME BOMBAN, ALAIN COUVREUR AND THOMAS DEBRIS-ALAZARD
- 2022 **Worst and Average Case Hardness of Decoding via Smoothing Bounds** *iacr.org*
THOMAS DEBRIS-ALAZARD AND NICOLAS RESCH
- 2022 **Smoothing codes and lattices: systematic study and new bounds** *iacr.org*
THOMAS DEBRIS-ALAZARD, LÉO DUCAS, NICOLAS RESCH AND JEAN-PIERRE TILLICH
- 2021 **Wavelet: Code-based postquantum signatures with fast verification on microcontrollers** *iacr.org*
GUSTAVO BANEGAS, THOMAS DEBRIS-ALAZARD, MILENA NEDELJKOVIĆ AND BENJAMIN SMITH
- 2021 **Quantum Reduction of Finding Short Code Vectors to the Decoding Problem** *arxiv.org*
THOMAS DEBRIS-ALAZARD, MAXIME REMAUX AND JEAN-PIERRE TILLICH
- 2020 **On the Hardness of Code Equivalence Problems in Rank Metric** *arxiv.org*
ALAIN COUVREUR, THOMAS DEBRIS-ALAZARD AND PHILIPPE GABORIT
- 2019 **About Wave Implementation and its Leakage Immunity** *iacr.org*
THOMAS DEBRIS-ALAZARD, NICOLAS SENDRIER AND JEAN-PIERRE TILLICH
- 2017 **The problem with the SURF scheme** *arxiv.org*
THOMAS DEBRIS-ALAZARD, NICOLAS SENDRIER AND JEAN-PIERRE TILLICH

Teaching

Polytechnique (2022-)

- **Introduction to quantum computing and quantum information (INF587)**

MPRI (2021-)

- **Error-correcting codes and applications to cryptography (with Anne Canteaut and Alain Couvreur)**, introduction to code-based cryptography

ENS Lyon (2021-2023)

- **Post-quantum cryptography (with Damien Stehlé and Benjamin Wesolowski)**, introduction to code-based cryptography

Polytechnique (2020-2022)

- **Introduction à l'informatique (INF361)**, under the supervision of François Morain
- **Introduction to cryptology (INF558)**, under the supervision of François Morain

ENSTA (2020-2021)

- **Mathématiques discrètes pour la protection de l'information**, under the supervision of Françoise Levy-Dit-Vehel

University Paris-Sorbonne (2016-2019)

- **Advanced Cryptography**, Master 1 under the supervision of Damien Vergnaud
- **Introduction of Cryptography**, 3rd year Bachelor under the supervision of Valérie Ménessier-Morain
- **Environment and Development in Linux**, 2nd year Bachelor under the supervision of Valérie Ménessier-Morain
- **Programming in C**, 1st year Bachelor

Program Committees

2021-2022 **Gilles Kahn Award**

SOCIÉTÉ INFORMATIQUE DE FRANCE

2022 **Journées Codage & Cryptographie (JC2)**

Presentations

Selected Talks at Seminars and Conferences

Oct, 2021	Quantum Reduction of Finding Short Code Vectors to the Decoding Problem , DAGSTUHL SEMINAR, QUANTUM CRYPTANALYSIS	<i>Dagstuhl</i>
Dec, 2019	Wave: A New Family of Trapdoor One-Way Preimage Sampleable Functions Based on Codes , ASIACRYPT 19'	<i>Kobe</i>
Sept, 2019	Wave: A New Family of Trapdoor One-Way Preimage Sampleable Functions Based on Codes , LONDON-ISH LATTICE CODING AND CRYPTO MEETINGS	<i>Imperial College, London</i>
May, 2019	Wave: A New Family of Trapdoor One-Way Preimage Sampleable Functions Based on Codes , CRYPTO MEETING	<i>ENS, Lyon</i>
Feb, 2019	Wave: A New Family of Trapdoor One-Way Preimage Sampleable Functions Based on Codes , CRYPTOGRAPHY SEMINAR	<i>PQShield, Oxford</i>
Dec, 2018	Two attacks on rank metric code-based schemes: Ranksign and an identity-based-encryption scheme , ASIACRYPT 18'	<i>Brisbane</i>
June, 2017	Statistical Decoding , ISIT 17'	<i>Aachen</i>

Workshops

Sept. 2020-**Organization of the team Grace Seminar**,

Inria Saclay

PRESENTATIONS: HERE

Sept. 2020-**Workshop on Transference**, ORGANIZED BY LÉO DUCAS

CWI

PRESENTATION: SMOOTHING BOUNDS FOR CODES AND LATTICES

Sept. 2019-2020 **Workshop “yet another crypto reading group”**, ORGANIZED BY MARTIN R. ALBRECHT

*Royal Holloway
University of London*

PRESENTATION: WORST-CASE HARDNESS FOR LPN AND CRYPTOGRAPHIC HASHING VIA CODE SMOOTHING

Mar. 2016 - **Workshop “code-based cryptography”**, ORGANIZED BY JEAN-PIERRE TILlich

Inria Paris

PRESENTATIONS: ON THE PSEUDORANDOMNESS OF THE DECODING PROBLEM VIA THE ORACLE COMPARISON PROBLEM, STATISTICAL DECODING, SURF : A NEW CODE-BASED SIGNATURE SCHEME, TWO ATTACKS AGAINST SCHEMES BASED ON RANK METRIC, NEW RESULTS ABOUT SIGNATURES BASED ON CODES, WAVE, WORST-CASE HARDNESS FOR LPN AND CRYPTOGRAPHIC HASHING VIA CODE SMOOTHING, AN ALGORITHMIC REDUCTION THEORY FOR BINARY CODES: LLL AND MORE, QUANTUM REDUCTION OF FINDING SHORT CODE VECTORS TO THE DECODING PROBLEM, SMOOTHING BOUNDS: FROM LATTICES TO CODES AND BACK TO LATTICES

Scientific Popularization

2021	Rendez-vous des Jeunes Mathématiciennes et Informaticiennes, Fête de la science à l'école Polytechnique, Olympiades de Mathématiques de l'Académie de Créteil
2018	International Tournament of Young Mathematicians (Jury Member)
2018	Tournoi Français des Jeunes Mathématiciennes et Mathématiciens (Jury Member)
2018	Rendez-vous des Jeunes Mathématiciennes et Informaticiennes

Skills

Programming	C, Java, Python, jkiloMagma, SageMath
Languages	French (native), English (fluent)

Reviews

2022	Asiacrypt, DCC, AMC, PQCrypto, JoC, ANR
2021	Eurocrypt, Crypto, CTRSA, DCC, ISIT, PQCrypto, ANR, IMACC, AMC, Latincrypt
2020	AMC, ITW, IEEE
2019	Eurocrypt, ISIT, DCC, PKC
2018	PQCrypto, WCC
2017	C2SI