

## Arithmetic Geometry in Shenzhen II

Handbook Last updated: November 19, 2025

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# 1 General info

## Para 1.1 (General info of conference).

- Conference Time: Nov. 24–28, 2025.
- Place: M1001, located on 1st Floor of College of Science Building.
- Organizers: Ziquan Yang (CUHK), Qing Xiang (SUSTech), Tong Liu (Purdue), Shizhang Li (MCM), Stavros Garoufalidis (SUSTech), Hui Gao (SUSTech)
- Website: <https://huigaomath.github.io/events/2025/2025-arithgeom-shenzhen.html>

## Para 1.2. Conference secretary/assistants

When contacting the secretaries/assistants, please feel free to cc:

Hui Gao: mathnature@gmail.com

- Ms. Min Zhang (English name: Mia) conference secretary.  
(in charge of **reimbursement**, invitation letter, entry to univ).  
email: zhangm7@mail.sustech.edu.cn  
cellphone: +86–13292887927 (+86 is China code).
- Ms. Jie Sheng  
in charge of hotel  
shengj@mail.sustech.edu.cn
- Mr. Shenrong Wang: postdoc, conf assistant.  
wangshenrongwsr@gmail.com
- Mr. Yimeng Tang: student, conf assistant.  
yimeng.tang.math@gmail.com

## 2 Schedule

Place: M1001, located on 1st Floor of College of Science Building.  
 (All in person talk; no video recording).

Time	Nov 24 (Mon.)	Nov 25	Nov 26	Nov 27	Nov 28 (Fri.)
09:25- 09:30	opening				
09:30- 10:30	Wiesława Nizioł	Ferdinand Wagner	Grigory Andreychev	Ian Gleason	Josh Lam
10:30- 11:00	☕ (coffee) <b>minimal:</b> see note	☕ + (*x*)	☕	☕	☕
11:00- 12:00	Pierre Colmez	Stavros Garoufalidis	Karol Koziol	Lucas Mann	Pol van Hoften
14:00- 15:00	Sean Howe	Hansheng Diao	FREE DISCUSSION	Andreas Mihatsch	END
15:00- 15:45	☕ (45min) <b>minimal:</b> see note	☕	no coffee	☕	
15:45- 16:45	Finn Wiersig	Zijian Yao		Zhiyu Zhang	

### Notes.

- A talk is usually 60min=55min+5min questions.
- Wifi: please use eduroam.
- Tea-break: due to funding restriction, there might be **only few** items during all tea-breaks.  
 我们建议大家自行购买报告厅隔壁的瑞幸咖啡（理学院店），比如报告快结束时手机下单。

### 3 Title and Abstract

#### Nov 24, Monday

**Title:** Topological Vector Spaces

**Speaker:** Wiesława Nizioł

**Abstract:** The category of Banach-Colmez spaces embeds fully into the category of Vector Spaces (pro-étale  $\mathbb{Q}_p$ -sheaves) as well as into the category of Topological Vector Spaces (enriched topological presheaves). I will discuss these embeddings and the computation of the Ext-groups of Banach-Colmez spaces. This is based on a joint work with Pierre Colmez.

**Title:** A locally analytic approach to the  $p$ -adic local Langlands correspondence for  $\mathrm{GL}_2(\mathbb{Q}_p)$

**Speaker:** Pierre Colmez

**Abstract:** I will explain how to construct the  $p$ -adic local Langlands correspondence for  $\mathrm{GL}_2(\mathbb{Q}_p)$  starting from the locally analytic one, using  $(\varphi, \Gamma)$ -modules over the Robba ring. This is joint work with Joaquin Rodrigues Jacinto.

**Title:** Twistors and the  $\mathbf{B}_{\mathrm{dR}}^+$ -jet sheaf

**Speaker:** Sean Howe

**Abstract:** For  $S$  a smooth rigid analytic variety over a  $p$ -adic field, we explain how to construct a functor from  $\mathbb{Q}_p$ -local systems on  $S$  to twistors on the relative thickened Fargues-Fontaine curve over  $S$ . This can be viewed as a new comparison theorem in relative  $p$ -adic Hodge theory and has applications to the differential study of period maps. Our construction combines the Liu-Zhu Riemann-Hilbert correspondence with a geometrization of a part of the de Rham comparison theorem via the  $\mathbf{B}_{\mathrm{dR}}^+$ -jet sheaf — the latter is an interesting object on its own, and we pose some questions about it.

**Title:** A Reconstruction Theorem for coadmissible  $\widehat{\mathcal{D}}$ -modules

**Speaker:** Finn Wiersig

**Abstract:** Let  $X$  be a smooth rigid-analytic variety. Ardakov and Wadsley introduced the sheaf  $\widehat{\mathcal{D}}$  of infinite order differential operators on  $X$ , along with the category of coadmissible  $\widehat{\mathcal{D}}$ -modules. In this talk, we present a Riemann–Hilbert correspondence for these coadmissible  $\widehat{\mathcal{D}}$ -modules. Specifically, we interpret a coadmissible  $\widehat{\mathcal{D}}$ -module as a  $p$ -adic differential equation, explain what it means to solve such an equation, and describe how to reconstruct the module from its solutions.

#### Nov 25 (Tuesday)

**Title:** Algebraic Habiro cohomology

**Speaker:** Ferdinand Wagner

**Abstract:** In their work on the Habiro ring of a number field, Garoufalidis-Scholze-Wheeler-Zagier explain how to construct a formally étale algebra over the Habiro ring for any étale extension of the integers. Moreover, they show that certain 3-manifold invariants take values in these rings. In this talk, I'll explain how to generalize their construction to smooth schemes of any dimension over the integers. Interestingly, the relation to 3-manifold topology seems to continue: In recent work, Garoufalidis and Wheeler have suggested constructions of explicit classes in algebraic Habiro cohomology, again starting from 3-manifold invariants.

**Title:** Habiro cohomology

**Speaker:** Stavros Garoufalidis

**Abstract:** We will report on experiments that lead to a new notion: Habiro cohomology, which is currently developed by Ferdinand Wagner, Peter Scholze, Campbell Wheeler and us. This new cohomology theory determines q-deRham, q-Hodge cohomology, and compares well with the prismatic cohomology of Bhatt-Scholze. Joint work with Campbell Wheeler.

**Title:** A  $p$ -adic monodromy theorem for curves

**Speaker:** Hansheng Diao

**Abstract:** We show that every de Rham  $p$ -adic local system on a smooth projective curve over a  $p$ -adic field becomes

semistable upon pullback to a finite cover of the curve. This result is a relative version of the classical  $p$ -adic monodromy theorem, which asserts that every de Rham representation is potentially semistable. This is a joint work with Heng Du, Yong Suk Moon, and Zijian Yao.

**Title:**  $p$ -adic Hyperbolicity for Shimura varieties and period images

**Speaker:** Zijian Yao

**Abstract:** The study of the geometry and arithmetic of Shimura varieties, and more generally, period domains, have had important applications in number theory and particularly in the Langlands program. A theorem of Borel from the 1970s says that any holomorphic map from a smooth complex algebraic variety to a Shimura variety is automatically an algebraic map. In this talk, I will discuss a  $p$ -adic analogue of this result both in the context of general Shimura varieties and for period domains. In particular, I will explain some inputs from the theory of prismatic cohomology. This is based on recent joint work with Ben Bakker, Abhishek Oswal, and Ananth Shankar.

### Nov 26 (Wednesday)

**Title:** Stacky approach to Galois representations

**Speaker:** Grigory Andreychev

**Abstract:** In ongoing joint work with Maximilian Hauck and Tasos Moulinos, we investigate the étale realization functor from prismatic  $F$ -gauges to Galois representations of  $\mathbb{Q}_p$  with coefficients in  $\mathbb{Z}_p$ ; in the course of this study, we construct an analytic stack in the sense of Clausen–Scholze whose category of quasi-coherent sheaves, or to be more precisely, its category of perfect complexes, is equivalent to the bounded derived category of finitely generated Galois representations.

**Title:** Parahoric Ext-algebras and derived Satake morphisms in characteristic  $p$

**Speaker:** Karol Koziol

**Abstract:** In recent years, there has been increased interest in understanding derived aspects of the mod  $p$  representation theory of  $p$ -adic reductive groups  $G$ , motivated by applications to the categorical Local Langlands program and moduli stacks of Galois representations. One hands-on method for making progress is to examine the structure of Hecke Ext algebras  $E^*(G, J)$  relative to a compact open subgroup  $J$  of  $G$ . These are derived analogues of the more familiar Hecke algebras  $H(G, J)$  over coefficient fields of characteristic  $p$ . In this talk, I'll present some of the structure theory of these algebras for various choices of  $J$  (Iwahori, hyperspecial, etc.). I'll also discuss the construction of derived Satake morphisms which relate  $E^*(G, J)$  with the analogous algebra of the maximal torus of  $G$  (at least if  $J$  is hyperspecial). This is joint work with (various subsets of) Ollivier, Pépin, and Stockton.

### Nov 27 (Thursday)

**Title:** On the schematic and analytic constructions of the local Langlands category

**Speaker:** Ian Gleason

**Abstract:** I will report on my upcoming collaboration with Linus Hamann, Alexander B. Ivanov, João Lourenço and Konrad Zou. In this project we compare two constructions of the automorphic side of the categorical Langlands correspondence. On one side of the comparison is the category  $D_{\text{ét}}(\text{Bun } G)$  considered by Fargues–Scholze, on the other side is the category  $\text{Shv}(B(G))$  considered by Zhu. We 1) outline the construction of the functor and 2) explain the overall strategy to show that it is an equivalence. Both 1) and 2) depend on geometric results due to G., I. and Zillinger.

**Title:** Towards a proof of the categorical local Langlands correspondence

**Speaker:** Lucas Mann

**Abstract:** The local Langlands correspondence aims to provide a natural bijection between certain sets of smooth representations of reductive groups on the one hand and Galois representations on the other hand. Fargues–Scholze's seminal work on the geometrization of the local Langlands correspondence has enabled a new access to the correspondence and in particular upgrades it conjecturally to an equivalence of categories, with ample applications to arithmetic geometry

and representation theory. In joint work with David Hansen we leverage classical results on the local Langlands correspondence in order to prove the categorical correspondence for  $\mathrm{GL}_n$  and potentially all classical groups – conditional on a yet unproven compatibility of Fargues–Scholze’s construction with parabolic induction, which is work in progress in a different project. Along the way we derive new results on ind-coherent sheaves on the stack of L-parameters and on ind-coherent sheaves on algebraic stacks in general.

**Title:** Transferring intersection number identities to characteristic  $p$

**Speaker:** Andreas Mihatsch

**Abstract:** The last few years saw proofs of several new intersection number identities such as the arithmetic fundamental lemma of Wei Zhang, or the Kudla-Rapoport Conjecture proved by Chao Li and Wei Zhang. In my talk, I will present a general technique for transporting such identities from mixed to equal characteristic which is based on close fields. The main new objects are profinite families of moduli spaces of formal  $O$ -modules, where  $O$  interpolates between mixed and equal characteristic. Our main results state that intersection numbers in such families stabilize as one approaches characteristic  $p$ . This is joint work with Sebastian Bartling.

**Title:** Monoids, spaces and fundamental lemmas without induction

**Speaker:** Zhiyu Zhang

**Abstract:** Many things in representation theory and intersection theory naturally depend on the group rather than the Lie algebra. Monoids provide a new way of thinking and studying group theoretic questions, in particular multiplicative version Hitchin spaces, and a new proof of fundamental lemma in Langlands program. I will discuss new applications to relative Langlands program and arithmetic Higgs bundles, including a proof of (arithmetic) fundamental lemma without induction on the rank. This is based on joint works with G. Wang and Z. Yun.

## Nov 28 (Friday)

**Title:**  $p$ -curvatures and non-abelian cohomology

**Speaker:** Josh Lam

**Abstract:** In a groundbreaking work in 1972, Katz proved that, if a Gauss-Manin differential equation has vanishing  $p$ -curvature for infinitely many  $p$ , then it has finite monodromy. In a joint work in progress with Daniel Litt, we prove a non-abelian version of this: precisely, if the  $p$ -curvature of a non-abelian Gauss-Manin differential equation (in the sense of Simpson) vanishes for infinitely many  $p$ , then the monodromy on integral points acts through a finite quotient. From this, we deduce many new cases of a conjecture of Ekedahl–Shepherd-Barron–Taylor and Bost. I will try to explain some ingredients in the proof, including some properties of non-abelian de Rham cohomology, both in characteristic zero and  $p$ , as well as a non-abelian Hodge index theorem.

**Title:**  $p$ -adic Fourier theory in families

**Speaker:** Pol van Hoften

**Abstract:** In this talk I will discuss Fourier a theory for  $p$ -divisible rigid analytic groups  $H$  in the sense of Fargues. This theory describes their spaces of global functions in terms of certain overconvergent functions on the dual of the  $p$ -adic Tate module of  $H$ . As an application, I hope to describe the Fourier transform of the modified Weierstrass  $p$  function as a function on the universal  $p$ -divisible rigid analytic group over the modular curve. This is joint work with Andrew Graham and Sean Howe.

## 4 Entering Shenzhen (from Hongkong)

**Para 4.1 (From HKG airport to Shenzhen border).** If you fly to HKG airport, you have to cross Hongkong/Shenzhen border—[involving Passport Control](#) for foreign citizens— before arrival in Shenzhen city.

1. Upon arrival in HKG airpot, We recommend using shuttle/coaches. see:  
<https://www.hongkongairport.com/en/transport/mainland-connection/mainland-coaches/>  
(taxi also works, but won't save you much time, and it costs more).
2. There are *several* border control locations on Hongkong/Shenzhen border. A **most convenient one** is [Shenzhen Bay Port](#) (深圳湾口岸) (tell your shuttle service counter). (Other “Port” (border control) works equally well; and different shuttle service companies work equally well).
3. Typical time from HKG to Shenzhen Bay Port (border) via shuttle: 30min.
4. Passport Control time: varies depending on crowd. Normally,  $\leq$  30 min.
5. After passport control, you need to walk to [Taxi area](#), which takes a bit walking (8-10min) in the outside and could be confusing for your first time (since most other people do NOT go to taxi, and hence you should not just follow the crowd...). Please follow signs, and ask around to make sure!
6. Taxi from Shenzhen/HK border to SUSTech area (for your hotels): 45min–1 hour.
7. For [Hotel info, Taxi-to-hotel notes](#): see §5.

## 5 Going to Hotel (and food) / 酒店与餐饮

**Contents** Please be careful about your HOTEL name!

- Hotel 1: Genpla Hotel/君璞酒店. §5.1.
- Hotel 2: SUSTech Guest House/ 南科大专家公寓 §5.2
- Food for both hotels. §5.3

### 5.1 Hotel 1: Genpla Hotel (outside SUSTech campus)/君璞酒店

**Para 5.1 (Hotel info : Genpla Hotel).**

(Pronounced as JunPu Hotel in Chinese.)

1. Address: Reception at Floor 7, Tang-Lang-Cheng Block C, No. 3333 Liu-Xian Avenue.  
It is within a shopping mall; front desk reception is at 7th floor.  
南山区留仙大道 3333 号塘朗城西区 C 座 7 楼 (前台在 7 楼)。  
Hotel phone number: +86-0755-27776988  
(+86 is China code, 0755 is Shenzhen code)

2. **Taxi notes in English.** (around 100–150 RMB, 40-60min.)

Notes to Taxi driver: Please bring me to Junpu (Genpla) Hotel. The entrance is near a Fountain.

**Chinese:** 请带我去深铁塘朗城君璞酒店。靠近塘朗地铁站。酒店入口靠近一个喷泉。

准确地址: 南山区留仙大道 3333 号塘朗城西区 C 座 7 楼。

Although the location of hotel is somewhat complicated, we have never heard of any previous visitor telling us the Taxi driver could not find it. (The hotel is reasonably well-known in this area).

When Taxi drops you off, you should see a “fountain” near entrance, as in following picture.

Then take elevator to **Reception on 7th floor.**



3. Check-in method: When you arrive, tell them that you have a reservation by the math department

**Remark 5.2.** Chinese only (if you take subway, which we do NOT recommend for newcomer).

强烈建议打车直接到酒店。如果坐地铁，从塘朗地铁站找到酒店会花费一些时间；因为酒店位于一个复杂的 mall 内部。如果是坐地铁到达，不要按照高德地图指示，而是从塘朗地铁站 A 出口直接进入塘朗城，往右前方走，进入乐购超市和万宁之间的走道，然后左转，可以看到君璞酒店的广告牌，广告牌左边即为酒店的电梯，乘坐电梯到 7 楼，7 楼为前台大厅及餐厅。如果乘坐计程车，直接到酒店 1 楼门口（背向留仙大道一侧），乘坐电梯上 7 楼。

## 5.2 Hotel 2: SUSTech Guest House/ 南科大专家公寓

**Para 5.3.** 中国老师/同学去南科大专家公寓。

1. 请您一定提前预约好入校小程序。见 Para 6.2.
2. 出租车开到南科大 2 号门。(1 号门也可以但没有 2 号门方便。而 3 号门完全封闭)  
给保安看入校码。解释一下您来开会要入住南科大专家公寓。保安大概率会放行。实在不行，步行到专家公寓也就 10min 左右。

**Para 5.4.** SUSTech Guest House info.

1. It is located *inside campus*.
2. Address: Xueyuan Ave. 1088, SUSTech. Guest House Building 1.  
Address: 南山区学苑大道 1088 号南方科技大学专家公寓 2 号楼 (cf. para 7.4 for pic)
3. Taxi notes. (around 100–150 RMB, 40-60min)

**Notes to Taxi driver: Please bring me to SUSTech Guesthouse.**

**Chinese:** 请带我去南山区学苑大道 1088 号南方科技大学专家公寓 2 号楼。请走南科大 2 号门。

(1 号门也可以但没有 2 号门方便。而 3 号门完全封闭)

For international guests: our secretary should have sent you a photo of a plastic card (with your name on it). When you arrive at SUSTech Gate, show your passport and the email-photo to security; they will let you in.

4. Check-in method: Tell them that you have a room reserved by the math department
5. **possible early check-out?** The rooms are reserved for check-in Nov 23 (Sunday), and check-out Nov 29 (Saturday).  
If you depart early, please inform them when you check-in. (this should cause no fee).
6. Hotel phone number: +86-0755-86664284 (+86 is China code, 0755 is Shenzhen code)

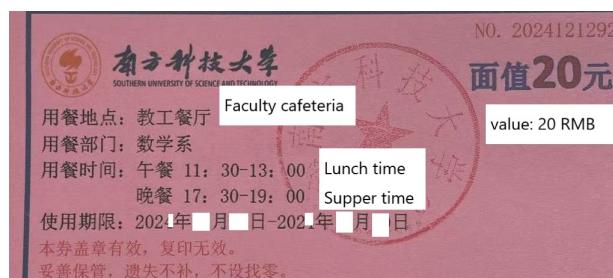
## 5.3 Food (餐饮)

**Para 5.5 (About Food ).**

1. Breakfast: (each) Hotel provides it.
2. Lunch and Supper: during conference talk days (Nov 24-28), we provide meal tickets (餐券).
3. Inside campus, there are McDonald/KFC/Subway/Starbucks; also some convenience store. There are lots of restaurants just outside of University Gate 1 (1 号门外很多餐厅)。
4. For Nov 23 and/or Nov 29, you **most likely** need to arrange food by your own.  
International visitors: if you need assistance for food on Nov 23 and/or Nov 29, please contact Hui Gao.  
中国同行：如果您 29 号还在深圳，我们建议您自己解决餐饮；其实不少食堂都能刷微信，可以提前问好工作人员。

**Para 5.6.** Two type of meal tickets. 我们把人群分流到两个餐厅，否则人太多。

1. Pink ticket for faculty cafeteria (location: near by Guest House hotel). (For Speakers, international guests, most participating faculties).



2. White ticket for student cafeteria. (大多数中国学生以及博士后)。餐厅(每天)也可以微信支付, 地址见 para 7.4(图片左中) .



## 6 Enter university campus / 入校

The university requires (certain) registration in order to enter campus, which unfortunately is not very friendly for foreign visitors...

**Para 6.1 (Entering SUSTech campus: International Guests, First day arrival).**

- We have registered your name to the university system.
- Show your passport to entrance guard at the gate and saying you are visiting Dept of Mathematics.
- (The above should suffice). In worst case (which should not happen), students walking by can speak English.
- Or, show following Chinese texts to entrance guard.

您好，我是访问南科大数学系高辉老师的外国教授，高辉的电话为：13262959192。

(Above reads: hello, I am an international professor, visiting Hui Gao in Dept of Math in SUSTech, Hui Gao's cellphone is 13262959192.)

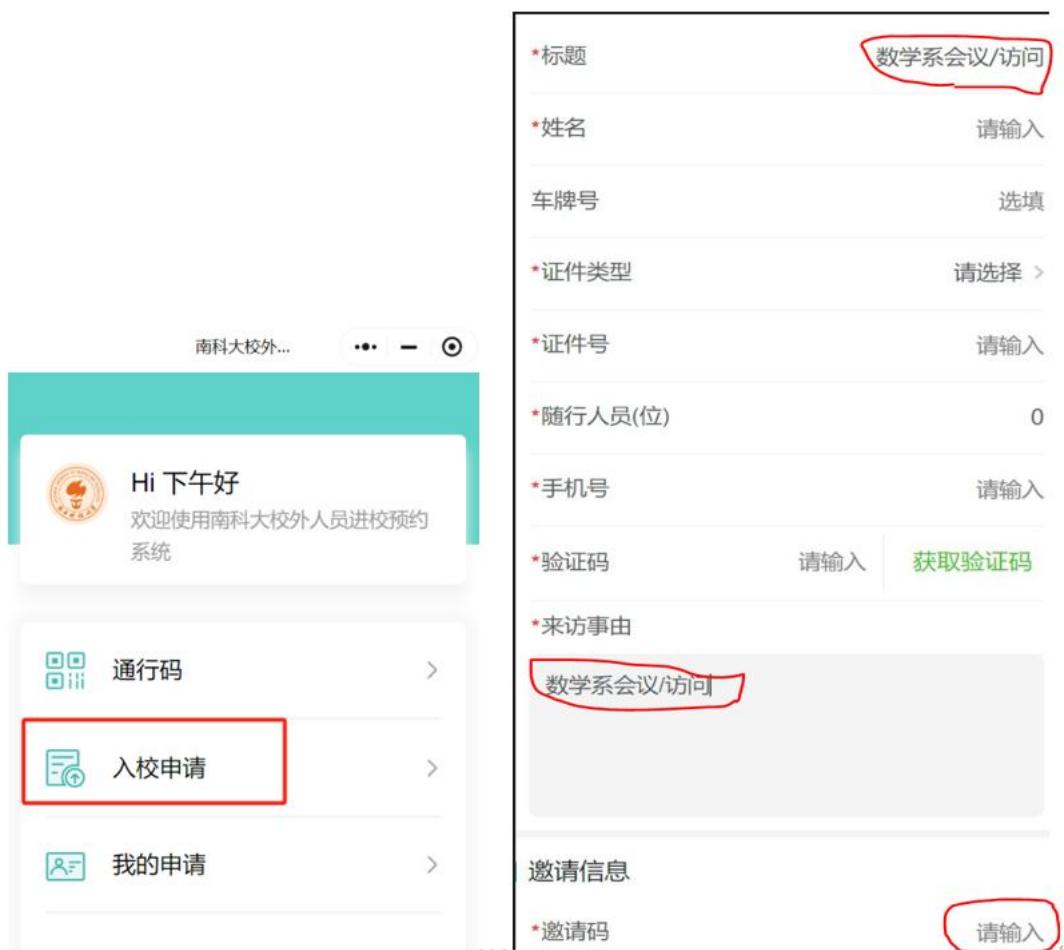
- Another helpful item. Show entrance guard my ID picture.



Chinese version (中文版): 见下页。

**Para 6.2** (Chinese version: 入校申请: 微信小程序).

1. 请提前至少 1 天申请入校。 (审核需要时间)
2. 微信小程序中搜索: “校外人员进校申请”(名字有点奇怪, 不含南科大, 但确实是这个)
3. 点击“入校申请”, 然后填写相关信息:
  - 标题: 数学系访问
  - 来访事由: 数学系访问 (高辉)
  - 邀请码: 44A95E (请勿外传给非参会人员; 会议后作废)
4. 每次预约可预约访问期至多**7 天**, 用完再重新申请。请确保您首次入校时间 (可能是会议前一天) 包含在内。
5. pic 见最下。
6. 审核完毕后, 进校时出示小程序中的“通行码”即可进校。



# 7 From Hotel to Math Dept/conference venue / 去会议地点

## Contents.

- From Genpla hotel to Math dept. §7.1.
- From SUSTech Guesthouse to Math dept. §7.2.

### 7.1 From Genpla Hotel (君璞酒店) outside campus

Para 7.1 (English version: From Genpla hotel to Math Dept ).

1. It should be easy to locate TangLang metro station (it is close to JunPu hotel); circled in bottom of picture. (cf pic in para 7.3.)
2. go north and follow the obvious road leading to Main Gate 1 of SUSTech.
3. How to enter SUSTech campus through Gate 1: see §6.
4. Once inside, pass the bridge in front of you, then you are at Science Building. There is an *overpass* between two buildings and the RHS is the entrance to **Math Dept**. Room M1001 is on the 1st floor of Math Department.

Para 7.2 (Chinese version: 从君璞酒店到报告厅 ).

1. 找到南科大 1 号门 (cf pic in para 7.3.)
2. 入校门指南: see §6.
3. 步行过桥就到了理学院。理学院有个楼之间天桥，那里右转最近的入口就是数学系 1 楼。
4. 实在找不到就找到瑞幸咖啡，那里紧挨着数学系。

Para 7.3 (Picture: from Genpla hotel to Math Dept).



## 7.2 From SUSTech Guest House (专家公寓) inside campus

Para 7.4 (Guest House (专家公寓) to Math Dept).

1. Very easy (you are ALWAYS inside campus). Locate track field nearby, then follow road along river. 10-15 minutes walk.



—END—