Pioneering exploration of Computer Graphics & Machine Learning in Industry

唐睿

酷家乐

目录

关于我们 – 酷家乐

世界级的团队，世界级的梦想

- 公司现有员工超1200人，团队成员多来自于国内浙江大学、清华大学等著名高校,部分获得包括麻省理工(MIT)、伊利诺伊大学香槟分校(UIUC)、密西根大学、巴斯大学等在内的名校的计算机硕士、博士学位。
- 研发团队占据总人数的1/3以上，硕士以上学历人数超过15%，
- 本科以上学历超90%。
- 前沿核心技术研发实验室KooLab
  - KooLab团队由精英成员组成，包括多名博士；均来自卡耐基梅隆大学、浙江大学、香港大学、滑铁卢大学、 巴斯大学等海内外知名学府；更有ACM国际亚洲区域赛金牌获得者。
  - 与多家科研机构保持前沿合作
  - 研究领域CV CG ML PR

黄晓煌

联合创始人 &董事长

陈航

联合创始人& CEO

朱皓

联合创始人&CTO

关于我们 – 酷家乐

酷家乐是一家面向未来的大家居全案设计平台及生态解决方案提供商，致力于为数字化升级提供一站式解决方案。平台以设计为入口，链接大家居行业生态，为家居企业提供设计、营销、生产、管理、供应链等场景的解决方案和服务，助力全行业实现“所见即所得”的愿景。

合作企业超

14,000个

覆盖全国3D户型图

90%

合作设计师超

6,500,000个

合作院校超

120家

总注册用户超

20,000,000个

日均渲染图量

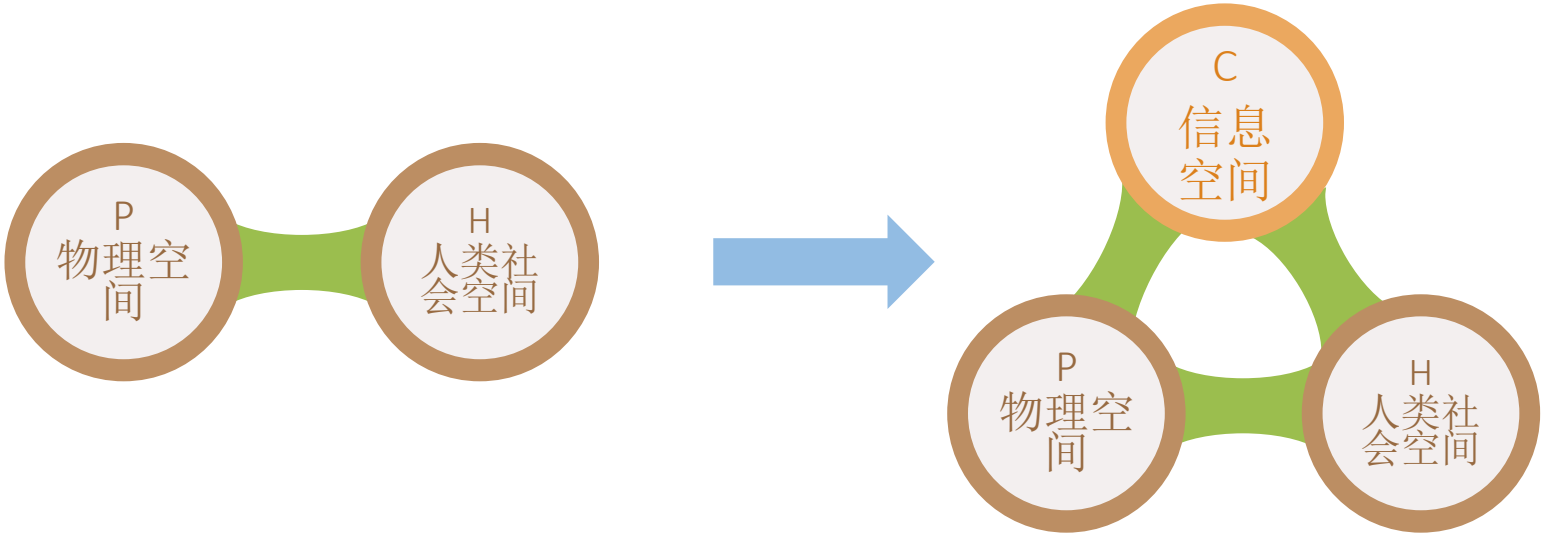
3,000,000张

产出家居设计方案

120,000,000个

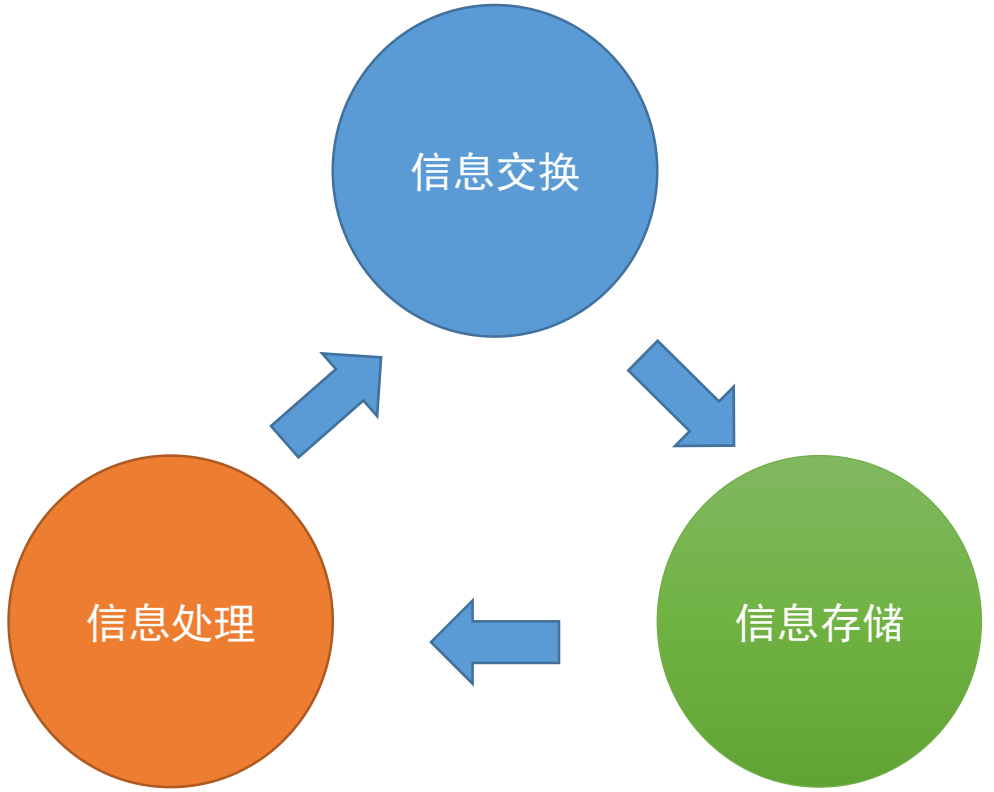
信息时代

科技的进步带来了信息力量的迅速壮大，使得世界正从原来的二元空间进入新的三元空间。



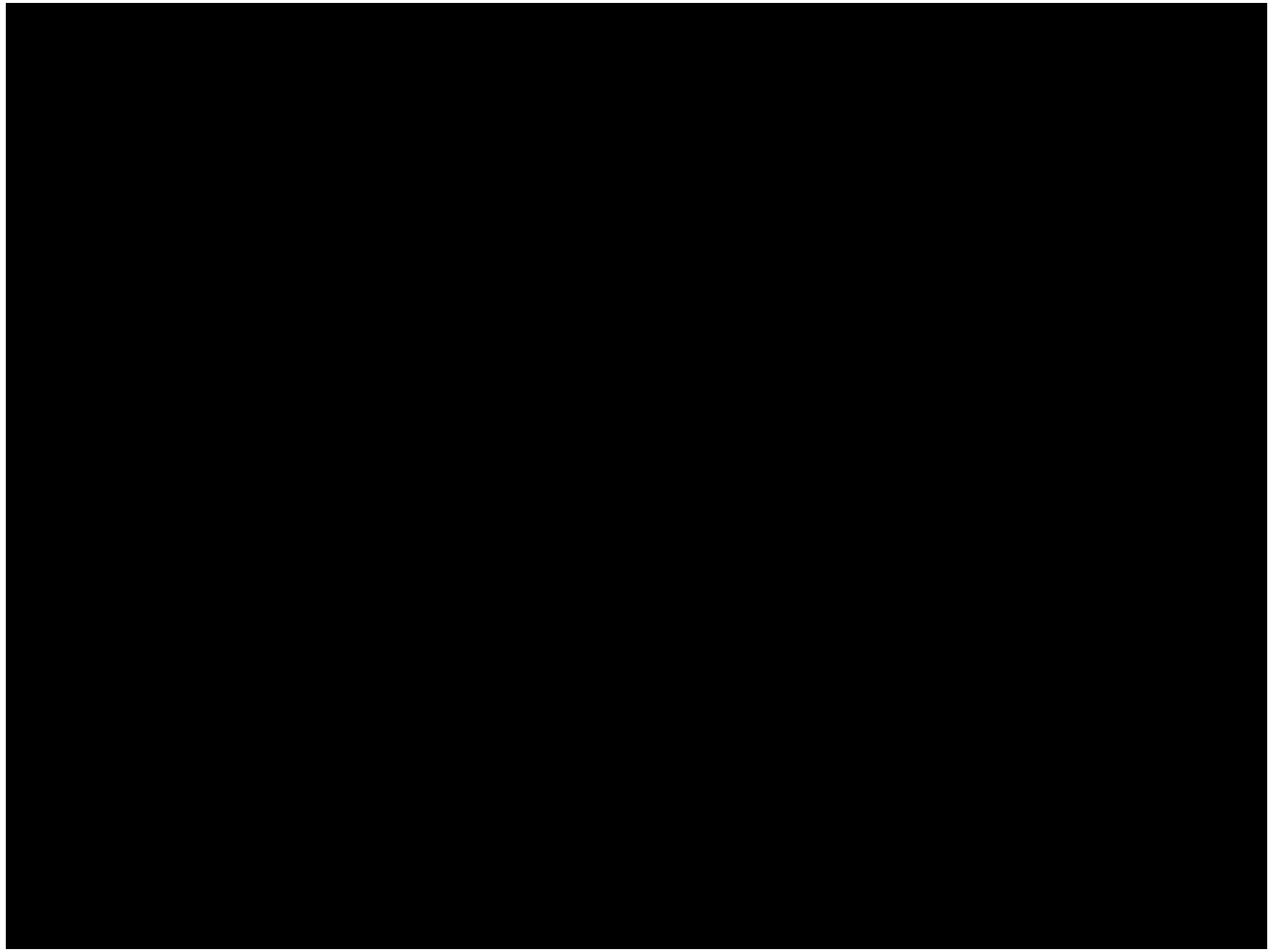
信息时代

- 核心要素
  - **大数据**
    - **信息交换、信息处理、信息存储**
  - **云计算**
    - **计算能力的“共享”盛宴**
  - **网络传输**
    - **为什么5G那么重要？**



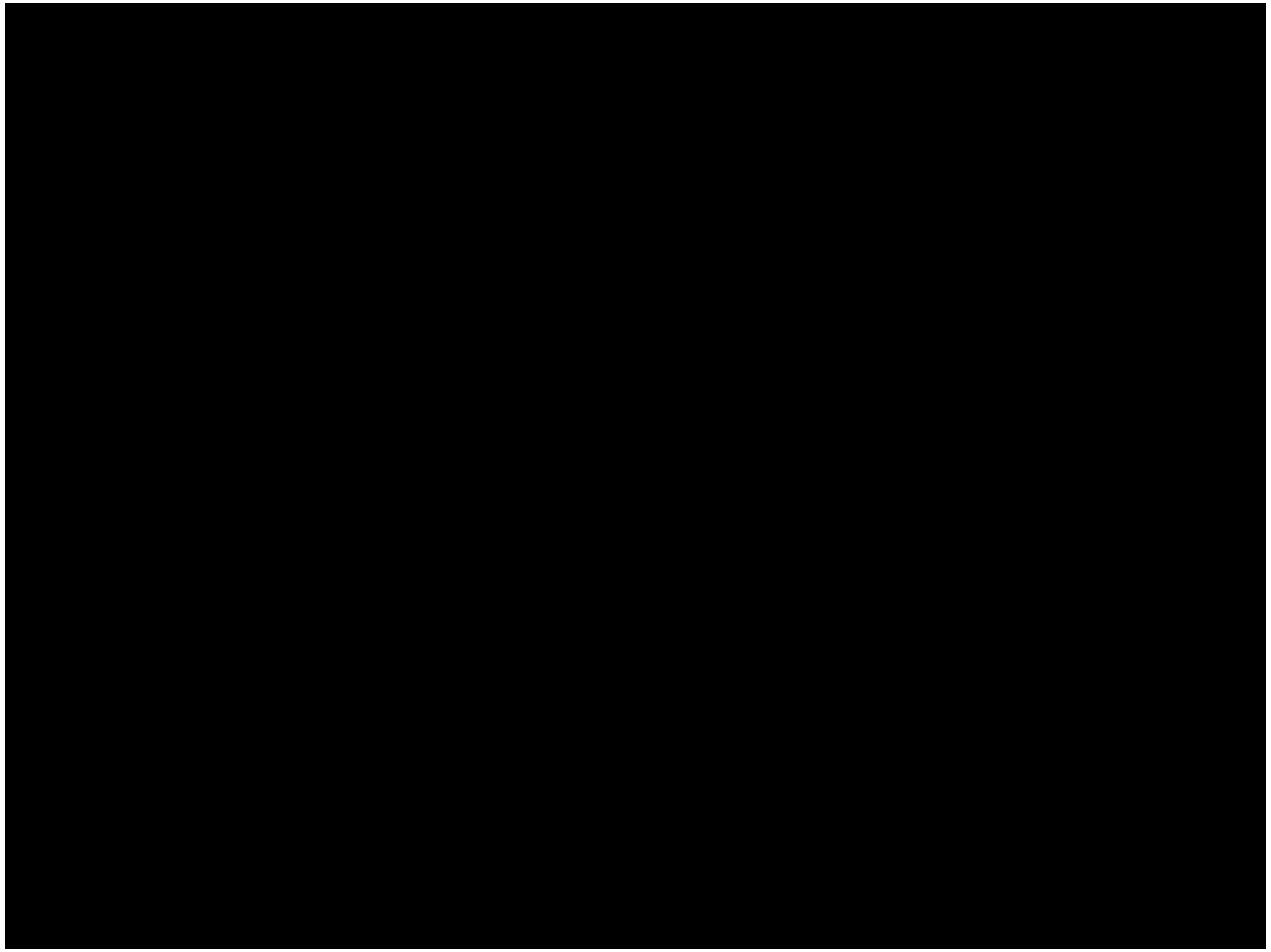
信息时代

- 信息时代下的家居行业
  - 大数据
    - 智能设计
    - 智能推荐
    - ……



信息时代

- 信息时代下的家居行业
  - 大数据
    - 智能设计
    - 智能推荐
    - ……
  - 云平台 + 云计算
    - 云户型：覆盖全国90%真实户型
    - 云素材：超4000万商品模型素材
    - 云渲染：10秒出效果图



信息时代

•信息时代下的家居行业

- 大数据
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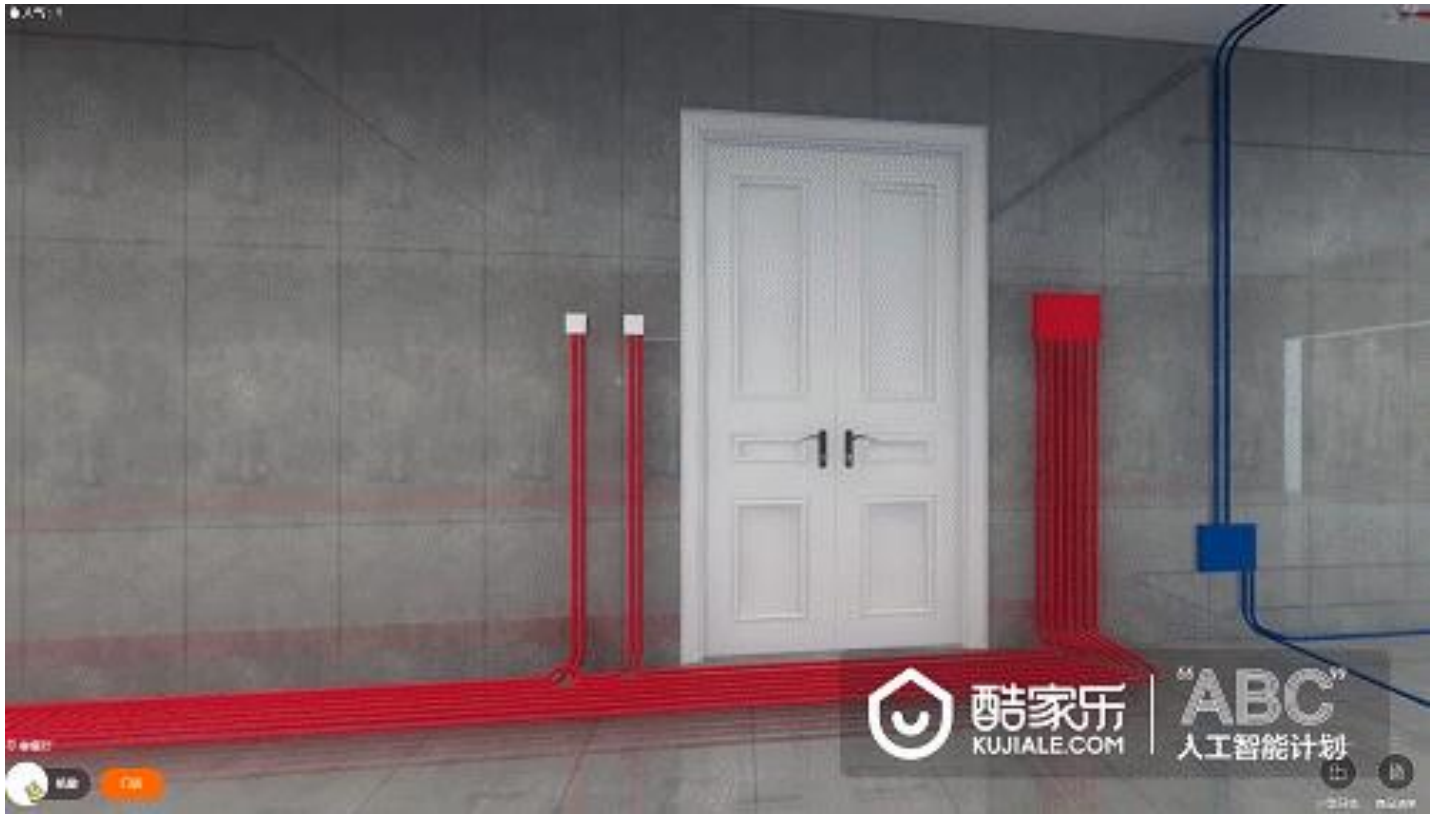
  - 云渲染：10秒出效果图
- BIM
  - 智能施工
  - 智能清单
  - 智能制造



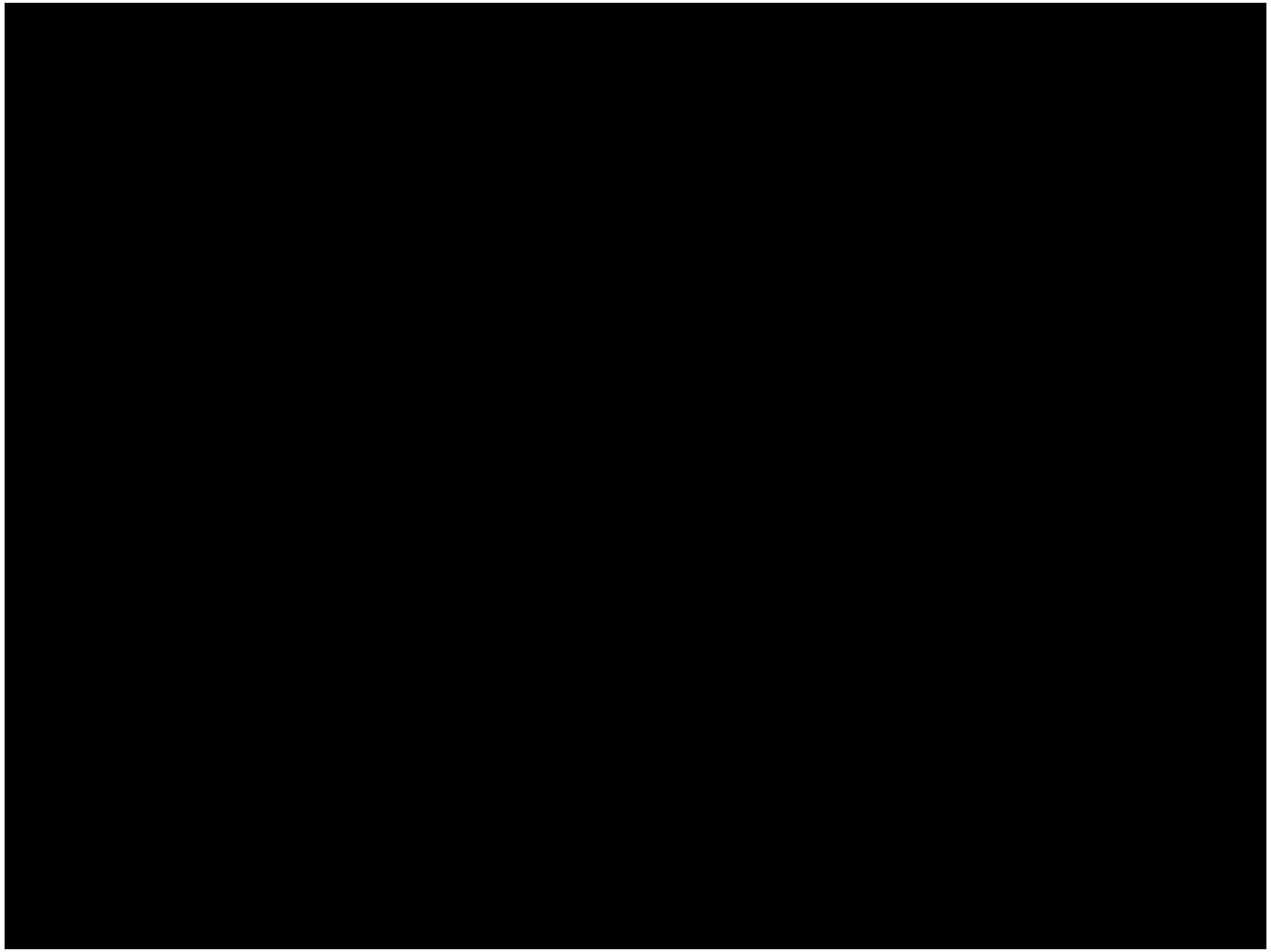
Data-driven Interior Plan Generation for Residential Buildings

http://staff.ustc.edu.cn/~fuxm/projects/DeepLayout/index.html

WENMING WU, University of Science and Technology of China, China
XIAO-MING FU, University of Science and Technology of China, China
RUI TANG, KooLab@Kujiale, China
YUHAN WANG, KooLab@Kujiale, China
YU-HAO QI, University of Science and Technology of China, China
LIGANG LIU, University of Science and Technology of China, China

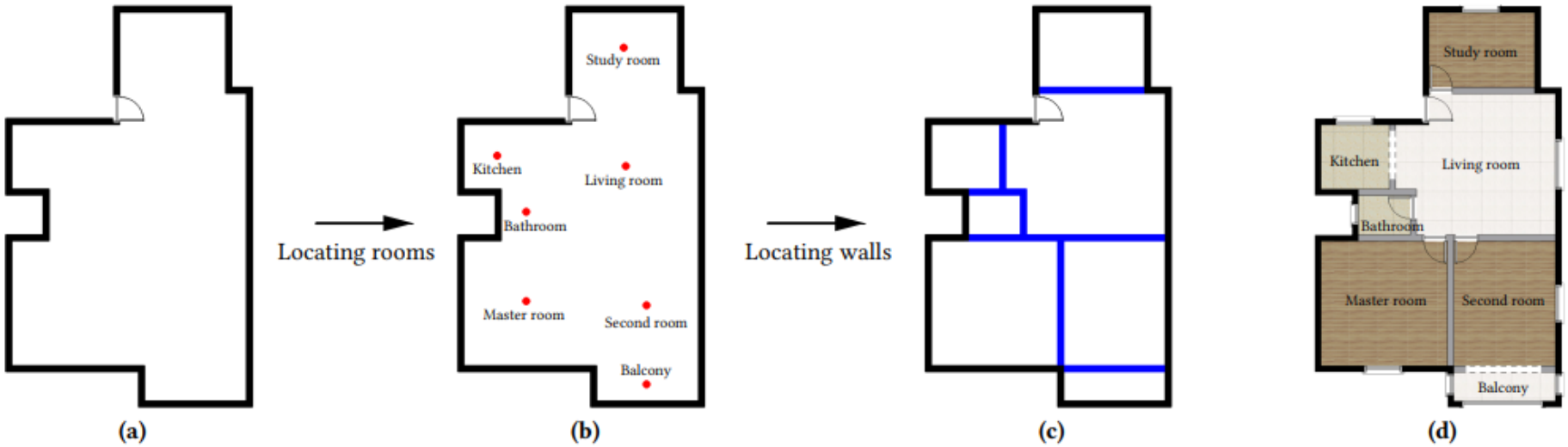
数据驱动下的智能设计

- 数据驱动
- 智能布局
- 灵活可配置
- 抽象&模拟人类设计过程



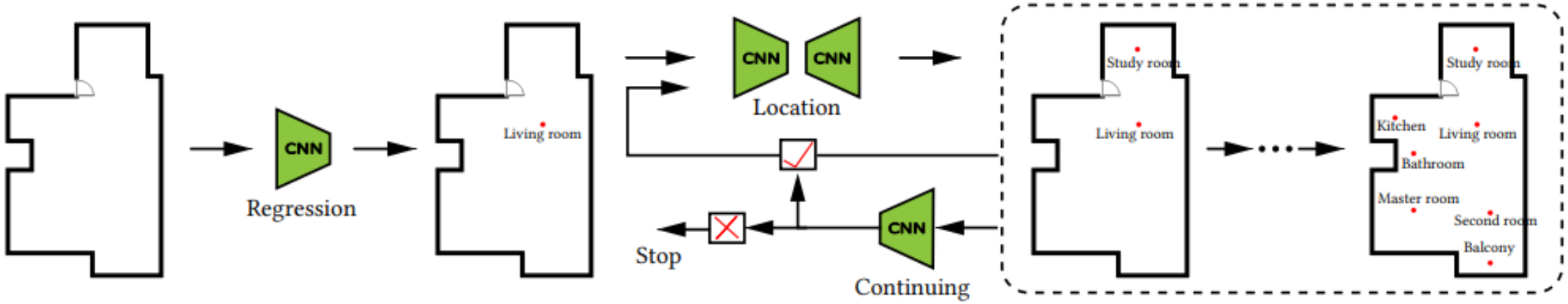
数据驱动下的智能设计

- System Overview



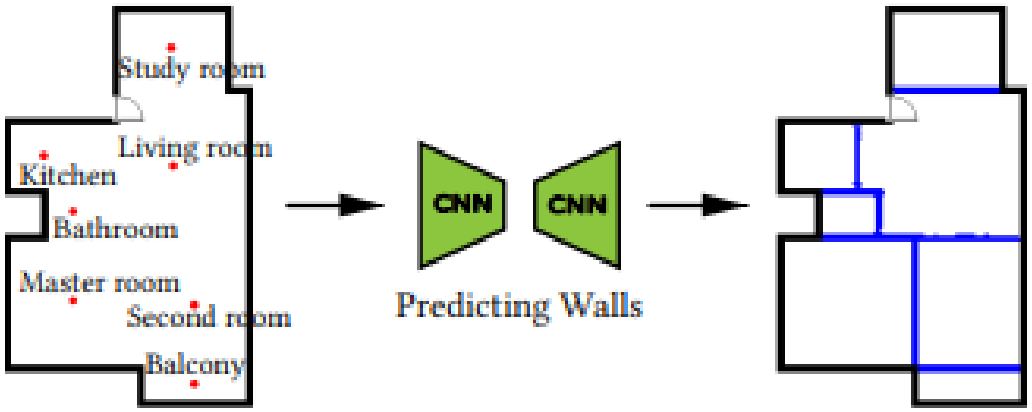
数据驱动下的智能设计

- Locating Elements (Room)

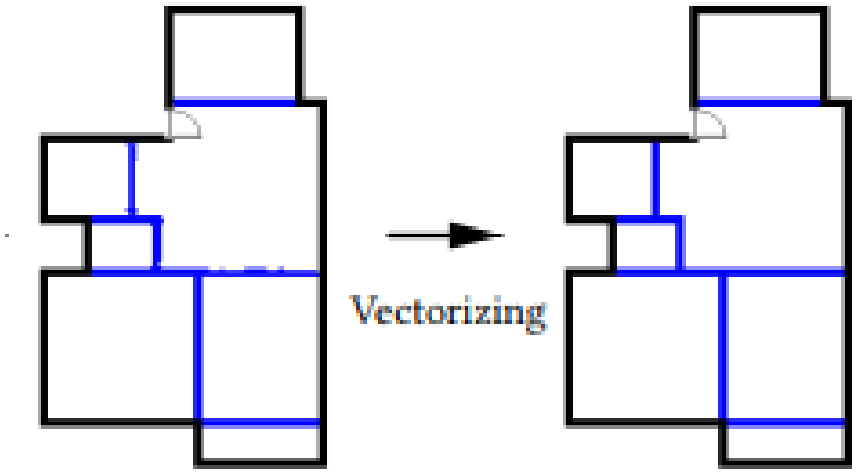


数据驱动下的智能设计

- Predicting Boundary & Regularization



Predicting Boundary



Regularization

数据驱动下的智能设计

- Results

基于生成对抗网络的渲染引擎

Adversarial Monte Carlo Denoising with Conditioned Auxiliary Feature Modulation

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KUN XU, BNRist, Department of Computer Science and Technology, Tsinghua University, China
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RUI TANG, KooLab, Kujiale, China

http://adversarial.mcdenoising.org/

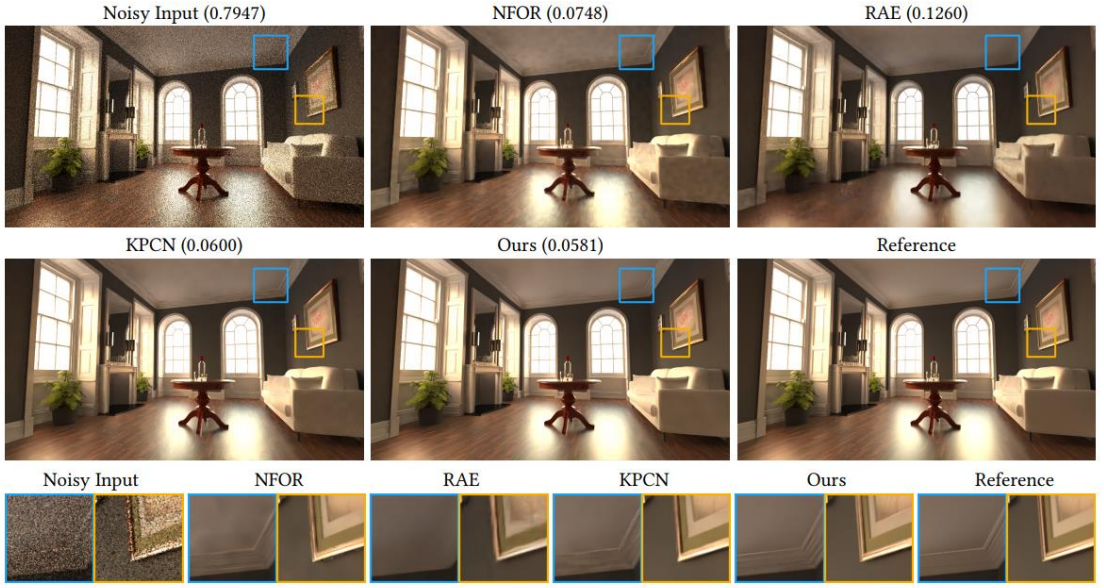
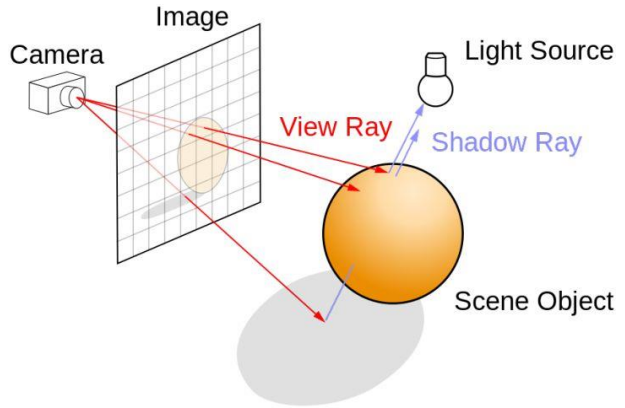


Fig. 1. Left to right; top to bottom: (a) 32 spp noisy image generated using a path tracer; (b) NFOR [Bitterli et al. 2016]; (c) Recurrent autoencoder [Chaitanya et al. 2017]; (d) KPCN [Bako et al. 2017] (e) our adversarial MC denoiser; (f) reference path-traced image with 32k spp. Numbers above indicate metric (1-SSIM).

基于生成对抗网络的渲染引擎

Problem Domain & Contribution

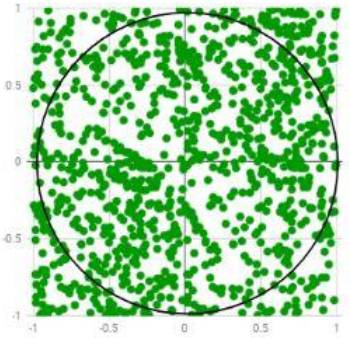


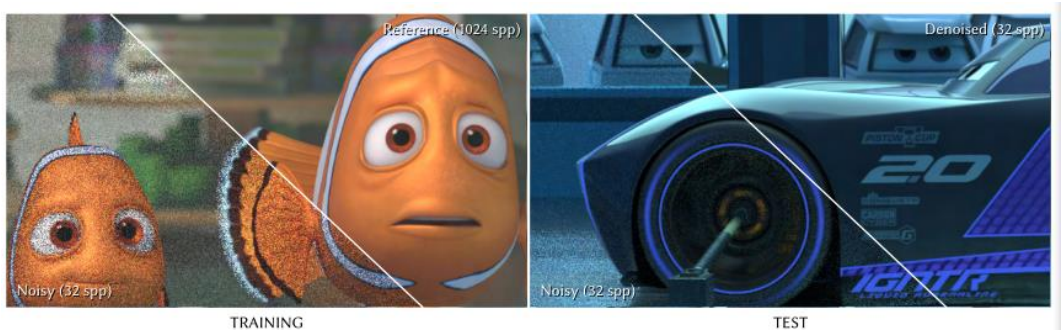
- 什么是渲染？ https://zhuanlan.zhihu.com/p/41269520
- 为什么渲染要降噪

RECONSTRUCTION

抛开渲染的问题域, 怎么做到有限乃至非常少的sample去重建?
比如说重建一条曲线. 提高重建质量

1. 增加采样点
2. 增加采样质量(更有代表性的) : adaptive sampling
(用过去的sample的experience)
3. 更多维的信息(auxiliary features) wlr, AI denoiser
3. 经验学习/借鉴已有的 => deep learning=> AI denoiser





KPCN 2017 (Image copyright @ Disney)

蒙特卡洛积分
- 抛针计算圆周率

基于生成对抗网络的渲染引擎

Problem Domain & Contribution

- 什么是渲染？ https://zhuanlan.zhihu.com/p/41269520
- 酷家乐极速渲染
  - •设计方案超过1.2亿个
  - •模型超过4000万
  - •每日渲染300万张的设计图
  - •自有3000台渲染服务器
  - •以上为全国首位

酷家乐FF Render Engine
10s

Vray Render Engine
60s

基于生成对抗网络的渲染引擎

Problem Domain & Contribution

- 什么是渲染？ https://zhuanlan.zhihu.com/p/41269520

- 酷家乐极速渲染

- Adversarial MC Denoiser
  - L1 ? L2 ? Or ???

- Conditioned feature Modulation
  - How to use cheap auxiliary features
    - Normal
    - Depth
    - Albedo

基于生成对抗网络的渲染引擎

Overview of our adversarial framework (First GAN MC Denoiser)

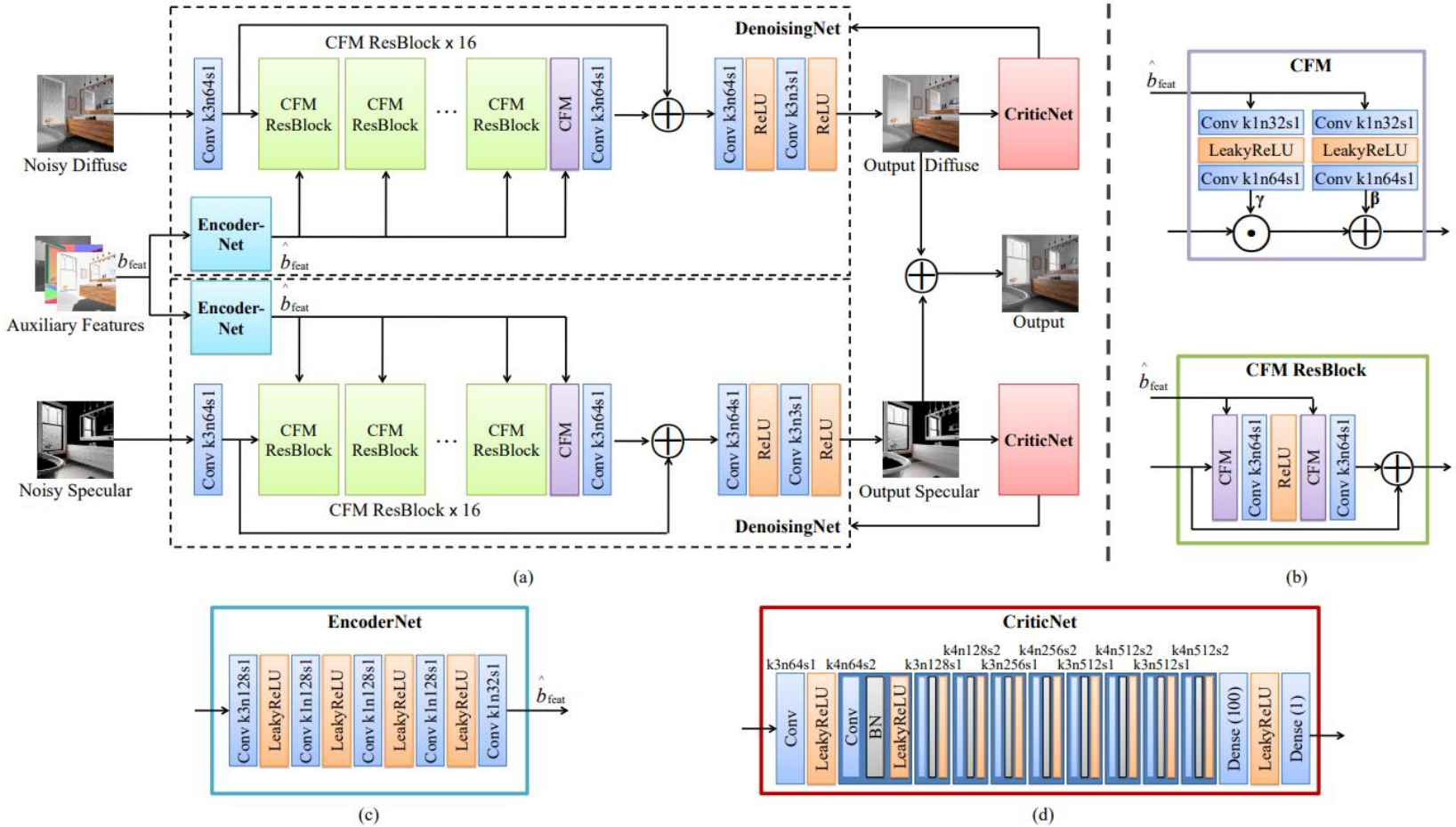
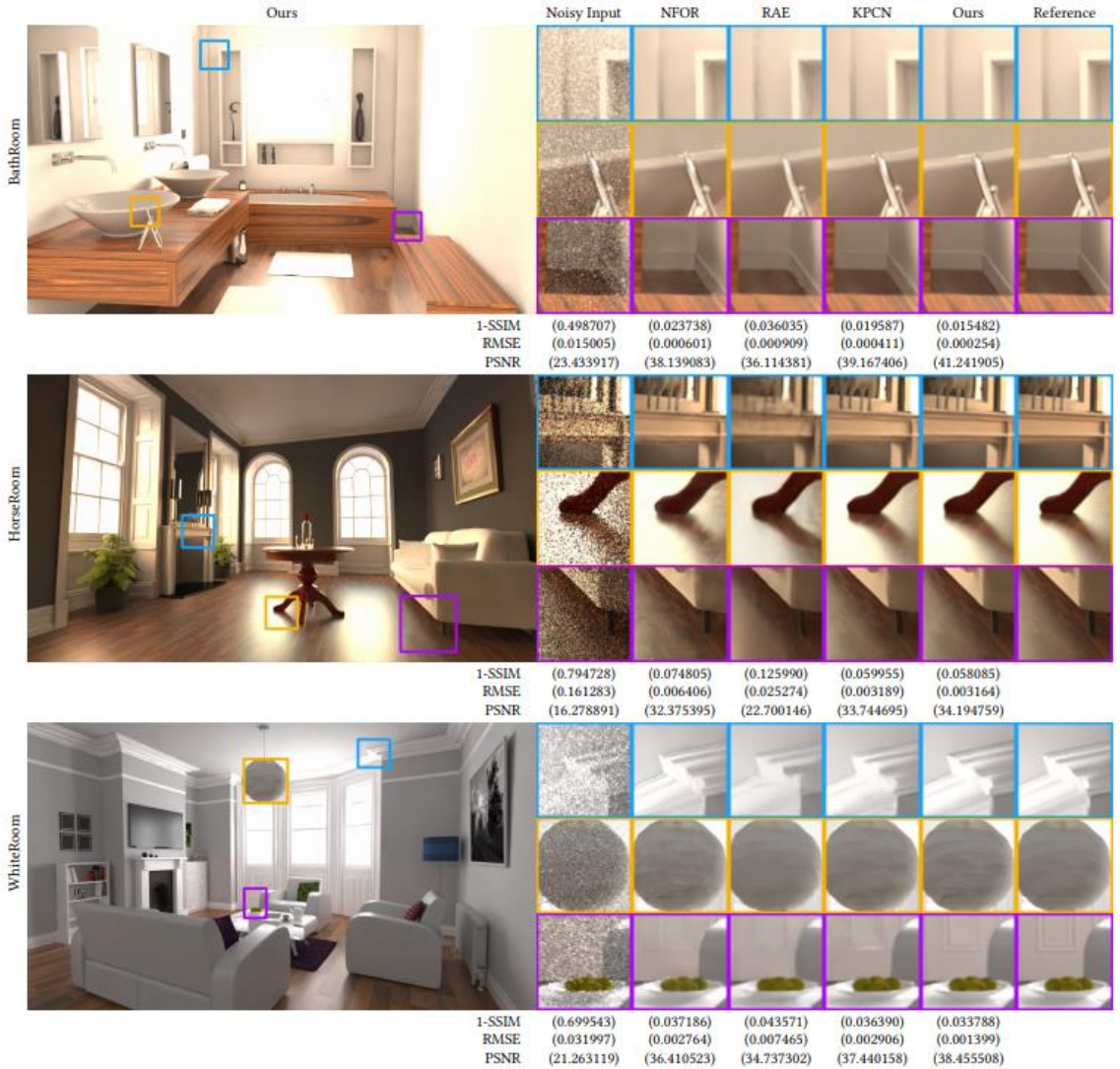


Fig. 2. (a) Overview of our adversarial framework; (b) Illustration of the residual block (ResBlock) for conditioned feature modulation; (c) EncoderNet; (d) CriticNet. Interpretation of network layer annotations: e.g, k3n128s1 indicates that kernel size is 3, number of feature channels is 128 and stride is 1.

基于生成对抗网络的渲染引擎

Result

Fig. 11. Comparisons of different feature utilizing methods. From left to right: (a) Training with no auxiliary features; (b) Concatenate the auxiliary features and noisy color as fused input; (c) Full model of CFM with a combination of shifting and scaling; (d) Reference.



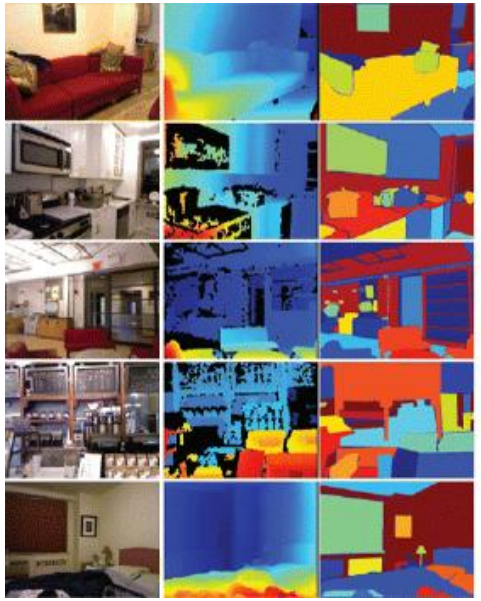
InteriorNet: Mega-scale Multi-sensor Photo-realistic Indoor Scenes Dataset

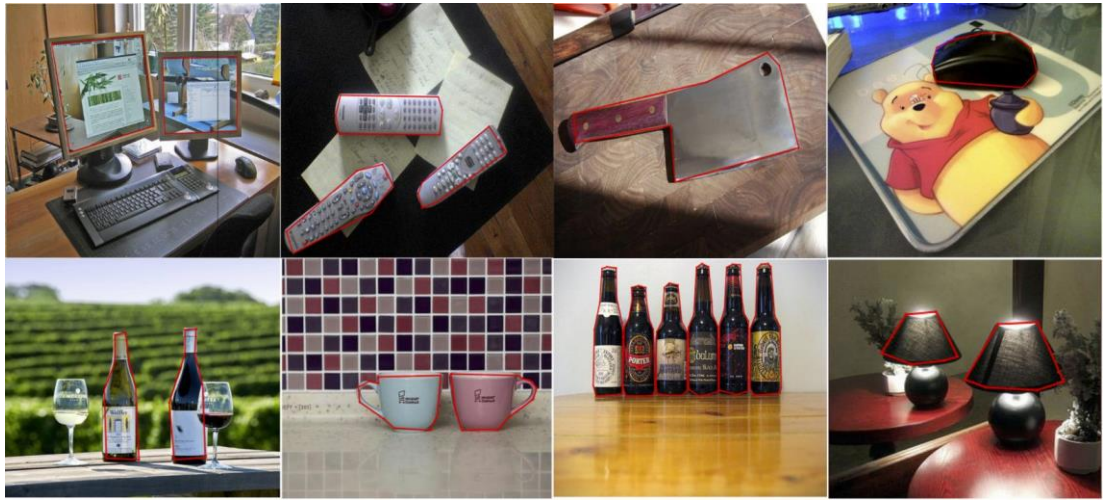
https://interiornet.org/

Wenbin Li, Sajad Saeedi, John McCormac, Ronald Clark, Dimos Tzoumanikas, Qing Ye, Yuzhong Huang, Rui Tang and Stefan Leutenegger

Imperial College London Kujiale.com

室内场景认知- InteriorNet

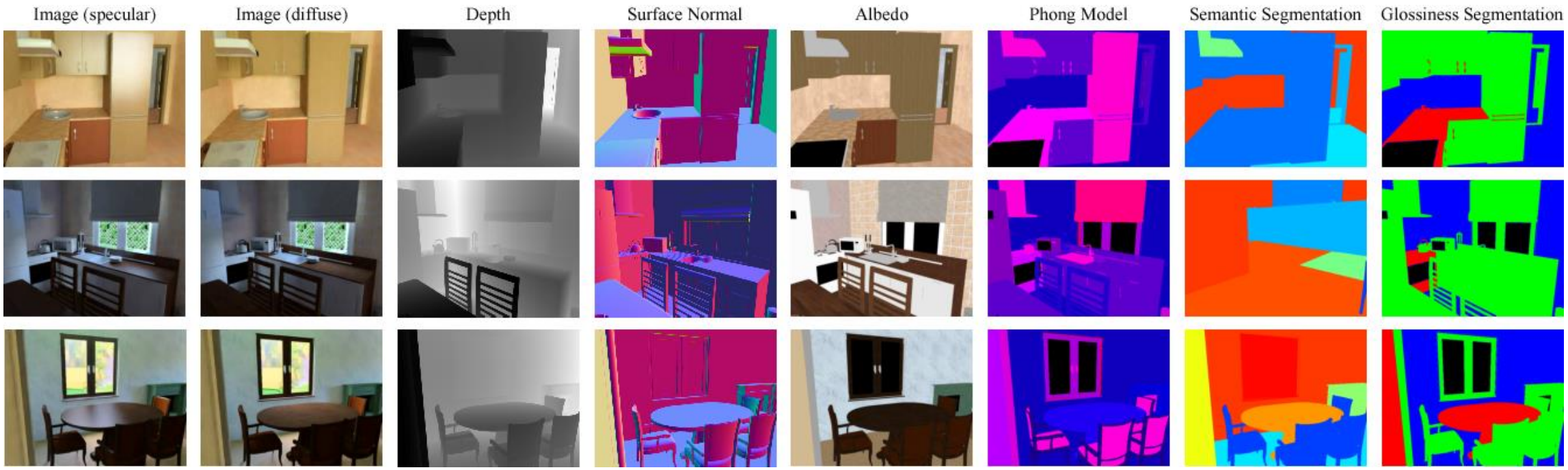




Real-world dataset

- Needed by various learning based system
- Images data with good photorealistic effects
- A small amount of ground truth
    - Manual labelling data
    - Low quality ground truth

室内场景认知- InteriorNet



SUNCG Dataset + Ground Truth

Synthesised dataset

- Easy to create large amount of data
- Easy to generate perfect ground truth
- Lack of photorealistic effects - images look fake

室内场景认知- InteriorNet

Synthesised Data

Real-world Data

Realistic gap between synthesised and real-world data

- An ideal dataset may
- Be big enough for represent the diversity of real world
- Need photorealistic effects as good as real-world data
- Content ground truth as perfect as synthesised data
- Contain flexible configurations for different requirements

室内场景认知- **InteriorNet**

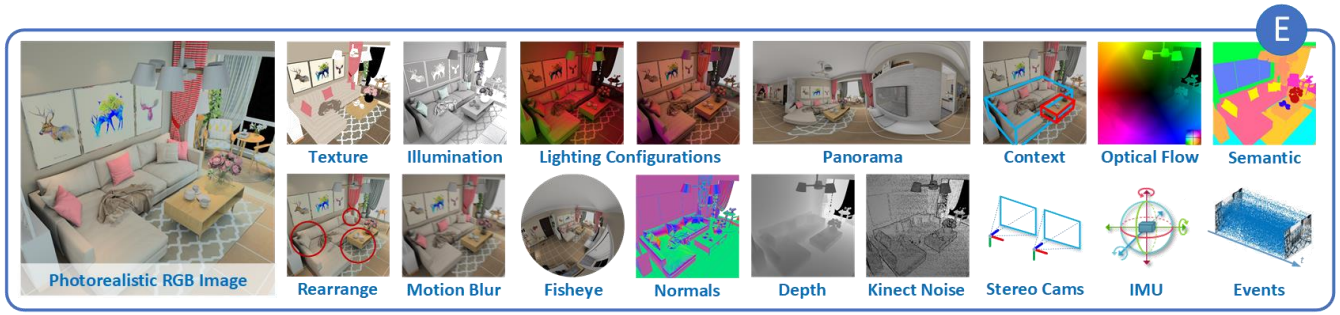
Real Decorations **Our Rendering**

InteriorNet is to bridge this reality gap

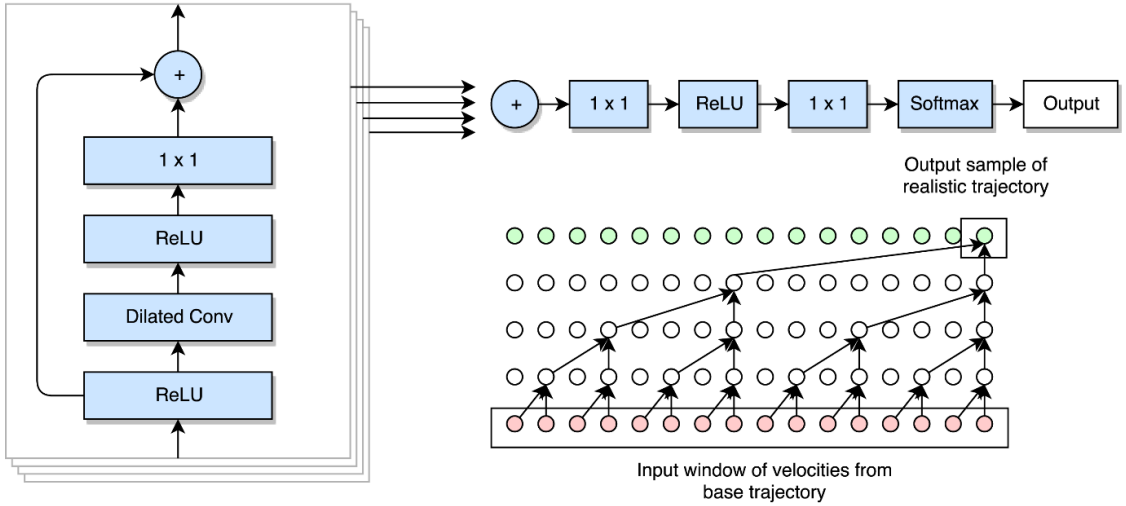
- Huge dataset with photorealisitic images and perfect ground truth
- The production level furniture CADs
- The same digital layouts of the real-world decorations
- A good realistic renderer

室内场景认知- **InteriorNet**

Simulating Tool + Mega Data



室内场景认知- InteriorNet



Our Synthesised Trajectory

Random realistic trajectory generation

- Create random trajectory as a base
- Use a variation of WaveNet
  - Learn realistic momentums from training data
  - Apply the realistic motion onto base random trajectory
- Good simulation to a handheld camera motion
  - Support various translation and rotation speed

信息时代下的AI

- 数据 = 基石

  大数据时代已经到来，要用大数据思维去发掘大数据的潜在价值。

- 处理模块 = 大脑

  “大数据”是需要新处理模式才能具有更强的决策力、洞察发现力和流程优化能力的海量、高增长率和多样化的信息资产。

  —— Gartner

- 大数据 + 新模块 = 高效工具 （例如IoT）

  “数据，已经渗透到当今每一个行业和业务职能领域，成为重要的生产因素。人们对于海量数据的挖掘和运用，预示着新一波生产率增长和消费者盈余浪潮的到来。”

  —— 麦肯锡

THANKS

KooLab 图形图像研究员

酷家乐 KUJIALE.COM

让未来生活所见即所得

上海几何算法中心