Digital China Abilities and Solutions

on Data Consulting for Industry Scenarios

面向行业业务挑战及痛点，神州数码围绕行业客户业务和数据进行展开，将业务管理知识和数据分析能力相结合，利用数学模型算法挖掘业务规律，支持业务管理决策，为不同数字化转型阶段的行业客户创造价值，实现数据资产变现和数字化转型赋能。

神州数码拥有顶尖级的专家团队，为多个行业的头部客户，运用数据模型算法，提供定量管理建设专业服务，拥有丰富的定量管理经验。团队成员善于：

- 熟练掌握定量分析的整个过程，根据数据状况制定清理及整理策略；
- 将数据同可视化展现相结合，运用可视化手段描述和理解数据；
- 具备很好的数学、统计功底，熟练运用各类模型和算法进行业务数据分析；
- 熟练掌握数据治理、数据探索、模型训练、策略应用等全周期数据价值挖掘流程；

航空餐食策略优化：

我国民航客运能力逐年提升，客户乘坐飞机出行的需求，以及对于服务质量的要求不断提高。但是新兴的高铁运输对民航运输带来了极大的挑战，价格更低、更便利、更舒适。且更受到新冠疫情的影响，航空公司如何在确保服务质量、增加客流的同时，降低成本，已经成为亟待解决的问题。航司的变动成本相对刚性，比如航油成本占比极高，起降费用相对固定。面对市场的巨大挑战，航空公司整体的盈利空间非常小。

神州数码通过对航司的飞行变动成本进行深入分析，探索变动成本中的影响因子及边界成本，实时监控成本的变化情况。以航班为核心，核算不同场景下的变动成本。建立成本仿真体系，以降本增效、提高利润为目标，为后续业务决策提供数据支持。

神州数码针对南方航空公司于 2019 年启动的绿色飞行的餐食活动，加工处理南方航空公司 CMS 系统中近 5 年超过 300 万个航班和超 3000 万条餐食数据，对机上餐食进行整体和专题分析在降低餐食浪费和成本方面，多维度分析绿色飞行航班和乘客的特点，从舱位、起飞时间、飞行时间、航线等角度分析绿色飞行的概率，例如公务舱乘客选择绿色飞行的概率超过 20%，根据这些特点进一步提高绿色飞行精准营销，减少餐食浪费。分析不同航班分舱位乘客配餐数量比例、价格、类型等，挖掘存在备份餐、配餐比例异常的航班等。特别的，占比约 30%的航程小于 2 小时国内航班配餐，识别其中约 0.6%的出现配餐异常。通过成本仿真体系制定的餐食配餐策略和成本监控体系，能够降低这些短程航班约 10%的餐食成本。

金融反欺诈：

汽车金融公司每年会接到百万级的购车贷款申请，单笔申请金额都在几十万元级别。欺诈者利用漏洞违规获得车辆后不再还款，会导致汽车金融公司无法回款，每个案件金额损失都在几万元以上。

神州数码将车贷申请人信息写入到申请反欺诈系统，这些信息包括申请人的姓名、性别、年龄、收入、住址、公司、联系方式、贷款方式等等。基于上述信息构建规则模型来预警可能的风险场景，例如某个联系方式在多个申请件中同时出现。同时反欺诈系统将社群信息，如联系方式、公司名称、家庭住址等进行分词，借助社交网络分析方法判断该申请人和其他黑灰名单人员的社群连接关系强弱，并根据相关性给出一个相关系数评分。

规则模型和社交网络分析评分会推送给决策引擎，并根据结果进行判断是否通过审批，还是需要风险管理人员进行人工审核。风险管理人员会根据收到的结果，查询申请件触发的欺诈风险规则或社交网络黑名单人员。如果判断为误判，则通过申请，否则拒绝申请。

汽车后市场供应链优化：

汽车零配件的生命周期远远超过汽车的生命周期，一辆整车按 6000 个左右的零配件，一个新车新增 2500-3000 个新配件，大多数企业需要管理超过 30000 个 SKU，上汽通用更是达到 14

万个以上的流通零件。零配件的供应和配送，从经销商和 OEM 厂商发出订单需求，到实际的配件配送的周期按周计算，并且零配件的需求受到季节性、周期性和区域性的影响。如果经销商和厂商保有大量库存以应对可能的零配件需求，则会导致大量的库存积压，库存成本高；但如果经销商和厂商不保有零配件库存，则会导致客户维修服务周期过长，降低客户满意度，导致客户流失。

神州数码将汽车零配件整体供应链中，供应商生产、供应链物流、库存流转等全流程进行数据采集和 KPI 监控。在上汽通用，将 14 万个流通零件，根据配件生命周期，将其分为投放期、增长期、稳定期、衰退期。投放期针对初始库存，缺少历史数据，可以通过聚类分析等方式，借鉴同类配件的需求规律进行短期预测；增长期已经积累了少量的历史销售数据，运用时间序列分析和回归模型进行短期预测；稳定期，需求数据已经具备明显规律性，可以采取多级预测调和的方法提高预测精度和预测时长；衰退期配件需要提前进行战略储备，参考同类配件需求进行补货。上汽通用预测零配件总体预测精度提高 3%左右，特别的，衰退期零配件（断点件）和部分稳定期零配件（成熟件）等汽车配件的预测精度提高了 5%以上，零配件一次满足率也保持在 95%的水平。

成品油零售定价策略：

中国成品油零售，除去发改委变价，各成品油零售企业在日常经营活动中还需根据市场的变化及时进行经营变价。考虑国外发达国家成品油零售行业发展，预计在近年内中国将放开成品油价格管制，该行业将进入全面市场化运营模式。成品油零售企业需要快速跟进市场化动态价格管理，提升核心竞争力。

神州数码将成品油零售企业的油卡系统、财务系统、供应商系统、HOS 系统等业务系统数据清洗整合，同时从第三方获取发改委成品油价格数据和外部竞争对手价格数据等。将全部用户根据行业、级别等信息，根据日均/年化成本品油购买量，结合加油站网点和价格政策、市场活动等进行分群，针对每个分群结果，统计对应销量或毛利，并进行价格弹性测试，判断该测试周期内影响收入、毛利、定价的主要因素。影响因素包括客群特征、价格策略、发改委定价变价、油机价格或价差、调价事件类型、时间周期、地理维度、竞争对手价格等。基于历史定价与对应 JV 销

量&毛利，以及采购价格、销量变化、竞争对手价格等因素条件，以毛利最大化为目标，找到最优价格策略。

酒店收益管理及动态定价：

酒店行业收益管理，过去主要是对房价和库存的简单管理，运用短期战术开展竞争；国内高端酒店以及外资酒店，积极将海量数据应用于收益管理工作，基于历史数据和分析技术，对酒店进行精细化的收益管理。酒店由于选址差异，可以分为商务型、旅游型、交通枢纽型等。不同类型的酒店，面向的主要客户细分市场也不尽相同，如旅行团体、商务团体、会议团体、上门散客、协议散客、长住散客、航班机组等。这些细分市场的客户的不同客房类型需求也存在明显差异。

如果客房定价提高，提高客单价的同时会导致客流下降，可能使客房空置；如果客房定价降低，降低客单价的同时会导致客房使用率提升，但是超售的客房订单也会造成酒店损失。酒店收益管理的核心是预测酒店客流，并根据预期客流量，制定最优的价格策略，平衡收入和成本使毛利最大化。

神州数码将各个酒店的客房管理系统、客户管理系统、财务管理系统等数据进行整合，并引入天气数据、假日数据、活动事件、营销政策等内外部数据，整合形成面向收益管理的主题数据集市。运用多元回归、ARIMAX、ESM、LSTM 等模型方法，对不同酒店的客流进行预测，并基于客流预测结果，制定酒店客房价格。在希尔顿中国，神州数码对 93 个酒店进行客流预测，整体误差在 4%以内，排除香港两个酒店整体误差在 1.4%左右。在预测应用窗口，整体酒店收入提升 12%。

医保精算与医保欺诈风险：

中国全民医保普及、人口老龄化加速、医疗机构的不断发展，使中国医保基金支出不断快速增长，全国医保基金年支出已超过 2 万亿元，全国医疗保险基金收入与支出逐年增高，从 2017 年起，基金结余率呈现下降趋势，基金充足率水平存在隐忧，较为准确预测基金未来收支发展势，

对于合理控制医保费用增长，科学管理医保基金使用起到重要作用。同时在医保经营管理的过程中，患者医生骗保等情况突出。2018 年沈阳骗保等案件，暴露我国医保经营管理的风险。每年因为骗保、费用不合理等情况导致的不必要支出达到上亿元，及时识别医保欺诈并进行止损和追责，对医保基金发挥最大社会价值起到了积极作用。

神州数码针对上海市医疗保险基金的收入、支出、结余三个模块进行医保精算。其中基金收入分为统筹基金和个人账户，包括当前征缴、财政补贴、利息及其他收入。基金收入受到参保人口结构、宏观经济、缴费基数等因素的影响。基金支出主要分为医疗支出和其他支出，医疗支出占到支出的主要部分，分为普通门急诊、门诊大病和住院三类，受到病种、就诊人数、次均费用等影响，特别受到人口结构影响，即老龄化影响。人口是医保基金重要影响因素，人口因素又分为在职参保人员和退休参保人员。神州数码运用时间序列、人口迁移重力模型、年龄移算模型等进行人口预测；然后对基金的收入和支持，采用指数平滑模型、Logistic 阻滞增长模型、核密度估计、弹性网络回归等方法进行预测。

针对医保欺诈，神州数码整合定点医疗保险结算数据和费用明细，全面分析医生诊疗行为，识别康复、理疗、中医治疗等风险严重诊疗项目。并根据医生开具的诊疗项目的数量、频次及项目间关联，建议预警指标体系。采用无监督机器学习方法，依据医生诊疗行为特征将医生进行分群，形成大数据预警模型，并对结果进行验证。根据验证结果，确定医生特征，利用 AHP 层次分析等方法，对医生疑点进行评分，并将评分结果按照高中低进行分级。针对上海市医疗保险，识别疑点医生 1000 余人，涉及疑点费用超过 1400 万元，其中高风险医生占到疑点医生总数 20%左右，涉及疑点费用占疑点费用总数超过 60%。

Facing industry business challenges and pain points, Digital China focuses on industry customer business and data, combines business management knowledge and data analysis capabilities, uses mathematical model algorithms to mine business rules, supports business management decision-making, serves and creates value for industry customers to realize the realization of data assets and empower at different stages of digital transformation.

Digital China has a top-level expert team, which has rich quantitative management

experience on using data model and algorithms to provide professional services for quantitative management construction for leading customers in multiple industries,.

Team members are:

- Familiar with the whole process of quantitative analysis, formulate cleaning and sorting strategies according to the data status;
- Familiar with Combining data with visual presentation, and using visual means to describe and understand data;
- Have a good foundation in mathematics and statistics, and proficiently use various models and algorithms for business data analysis;
- Familiar with data management, data exploration, model training, strategy application and other full-cycle data value mining processes;

Optimization of airline meal strategy:

The passenger transportation capacity of my country's civil aviation has been increasing year by year, and the demand of customers for traveling by air and the requirements for service quality have been continuously improved. However, the emerging high-speed rail transportation has brought great challenges to civil aviation transportation, which is cheaper, more convenient and more comfortable. And more affected by the new crown epidemic, how airlines can ensure service quality and increase passenger flow while reducing costs has become an urgent problem to be solved. The variable costs of airlines are relatively rigid. For example, the cost of jet fuel accounts for a very high proportion, and the cost of take-off and landing is relatively fixed. Faced with the huge challenges of the market, the overall profitability of airlines is very small.

Digital China conducts in-depth analysis of the airline's flight variable costs, explores the influencing factors and boundary costs in the variable costs, and monitors the changes in costs in real time. Taking flight as the core, calculate the variable cost in different scenarios. Establish a cost simulation system, with the goal of reducing costs, increasing efficiency, and increasing profits, and provide data support for subsequent business decisions.

In response to China Southern Airlines' green flight meal activities launched in 2019, Digital China has processed more than 3 million flights and over 30 million meal data in China Southern Airlines' CMS system in the past five years, and integrated and integrated the in-flight meals. In terms of reducing meal waste and cost, the thematic analysis analyzes the characteristics of green flight flights and passengers in multiple dimensions, and analyzes the probability of green flight from the perspectives of cabin, departure time, flight time, and route. For example, the probability of business class passengers choosing green flight exceeds 20%, based on these characteristics, further improve precision marketing of green flight and reduce food waste. Analyze the proportion, price, type, etc. of the number of passengers catering for different flights, and discover the flights with backup meals and abnormal catering ratios. In particular, about 30% of the voyages are less than 2 hours of domestic flight catering, and about 0.6% of these flights have catering abnormalities. The meal catering strategy and cost monitoring system formulated through the cost simulation system can reduce the meal cost of these short-haul flights by about 10%.

Financial anti-fraud:

Auto finance companies receive millions of applications for car purchase loans each year, with a single application amount in the hundreds of thousands. Fraudsters use loopholes to illegally obtain vehicles and no longer repay, which will cause auto finance

companies to be unable to return the payments, and the amount of loss in each case is more than tens of thousands of yuan.

When car loan applicant information writes into the application anti-fraud system, which includes the appli cant's name, gender, age, income, address, company, contact information, loan method, and so on, Digital China build rule models based on the above information to warn of possible risk scenarios, for example, a certain contact method appears in multiple applications at the same time. At the same time, the anti-fraud system divides the community information, such as contact information, company name, home address, and uses social network analysis methods to determine the strength of the social connection between the applicant and other black-and-grey-listed individuals, and give them based on the relevance. As a result, a correlation coefficient score will be output.

The rule model and social network analysis score will be pushed to the decision engine, and based on the results, it will be judged whether the approval is passed, or it needs manual review by risk management personnel. According to the received results, the risk management personnel will query the fraud risk rules triggered by the application or the social network blacklist personnel. If it is judged as a misjudgment, the application is approved, otherwise the application is rejected.

Supply chain optimization of automotive aftermarket:

The life cycle of auto parts and accessories far exceeds the life cycle of a car. A complete vehicle has about 6000 spare parts, and a new car adds 2500-3000 new parts. Most companies need to manage more than 30,000 SKUs. Top companies such as SAIC GM even has more than 140,000 parts. The supply and distribution of spare parts, from the order requirements issued by distributors and OEMs, to the actual spare parts

distribution cycle, is calculated on a weekly basis, and the demand for spare parts is subject to seasonal, periodic and regional influences. If distributors and manufacturers maintain a large amount of inventory to cope with the possible demand for spare parts, it will lead to a large inventory backlog and high inventory costs; but if the distributor and manufacturer do not maintain spare parts inventory, it will lead to a long customer maintenance service cycle. Reduce customer satisfaction and lead to customer loss.

Digital China collects data and monitors KPIs in the entire supply chain of auto parts, supplier production, supply chain logistics, and inventory circulation. At SAIC GM, more than 140,000 circulating parts are divided into the launch period, growth period, stable period, and decline period according to the life cycle of the accessories. For the initial inventory and lack of historical data during the launch period, short-term forecasts can be made through cluster analysis and other methods to learn from the demand for similar accessories; a small amount of historical sales data has been accumulated during the growth period, and short-term forecasts have been made using time series analysis and regression models; In the stable period, the demand data has obvious regularity, and multi-level forecasting and reconciliation can be adopted to improve the forecasting accuracy and forecasting time; the parts of the recession period need to be strategically reserved in advance, and replenishment with reference to the needs of similar parts. SAIC GM predicts that the overall forecast accuracy of spare parts has increased by about 3%. In particular, the forecast accuracy of auto parts such as recession parts (breakpoint parts) and some stable parts (mature parts) has increased by more than 5%. The satisfaction rate is also maintained at 95%.

Retail pricing strategy for refined oil products:

China's refined oil retail price change by the National Development and Reform Commission, each refined oil retail enterprise needs to change prices in a timely manner in accordance with market changes in their daily operations. Considering the development of the refined oil retail industry in developed countries, in recent years, China will liberalize the price control of refined oil, and the industry will enter a fully market-oriented operation model. Refined oil retail companies need to quickly follow up market-based dynamic price management to enhance their core competitiveness.

Digital China cleans and integrates the oil card system, financial system, supplier system, HOS system and other business system data of refined oil retail companies, and at the same time obtains the NDRC refined oil price data and the price data of external competitors from third parties. All users are grouped according to industry, level and other information, according to the daily/annualized cost of oil purchases, combined with gas station outlets, price policies, market activities, etc., and for each grouping result, the corresponding sales or gross profit are calculated and carried out the price elasticity test is to determine the main factors affecting revenue, gross profit, and pricing during the test period. Influencing factors include customer group characteristics, price strategies, NDRC pricing changes, diesel engine prices or spreads, price adjustment event types, time periods, geographic dimensions, and competitors' prices. Based on historical pricing and corresponding JV sales & gross profit, as well as factors such as purchase prices, sales changes, competitor prices, etc., the optimal price strategy is found with the goal of maximizing gross profit.

Hotel revenue management and dynamic pricing:

Revenue management in the hotel industry used to be mainly simple management

of room prices and inventory, using short-term tactics to compete; domestic high-end hotels and foreign-funded hotels actively apply massive data to revenue management, and refine hotels based on historical data and analysis techniques Improved revenue management. Due to differences in location, hotels can be divided into business type, tourism type, transportation hub type, etc. Different types of hotels face different market segments for major customers, such as travel groups, business groups, conference groups, door-to-door individual tourists, contract individual tourists, long-term individual tourists, flight crews, etc. There are also obvious differences in the needs of different room types of customers in these market segments.

If the price of a room is increased, the increase in the unit price of guest will result in a decrease in passenger flow, which may make rooms vacant; if the price of the room is lowered, the reduction of the unit price of guest will also lead to an increase in the room utilization rate, but oversold room orders will also cause hotel losses. The most important part of hotel revenue management is to predict hotel guest flow, and formulate the optimal price strategy based on the expected guest flow, balance revenue and cost to maximize gross profit.

Digital China integrates the guest room management system, customer management system, financial management system and other data of each hotel, and introduces internal and external data such as weather data, holiday data, event events, marketing policies, etc., to form a theme data mart for revenue management . By using multiple regression, ARIMAX, ESM, LSTM and other model methods to predict the passenger flow of different hotels, Digital China could formulate hotel room prices based on the results of passenger flow prediction. In Hilton China, Digital China made passenger flow forecasts for 93 hotels, and the overall error was within 4%. Excluding the two Hong Kong hotels, the overall error was about 1.4%. In the forecast application window, overall hotel revenue increased by 12%.

Medical insurance actuarial and medical insurance fraud risk:

The popularization of China's universal medical insurance, the accelerated population aging, and the continuous development of medical institutions have led to rapid growth in China’ s medical insurance fund expenditures. The national medical insurance fund’ s annual expenditure has exceeded 2 trillion yuan, and the national medical insurance fund income and expenditure have increased year by year. As a result, the fund balance ratio has shown a downward trend, and there are hidden concerns about the level of fund adequacy ratios. A more accurate forecast of the future development trend of the fund’ s revenue and expenditure plays an important role in the reasonable control of the growth of medical insurance expenses and the scientific management of the use of medical insurance funds. At the same time, in the process of medical insurance operation and management, patients and doctors cheating insurance are prominent. In 2018, Shenyang insurance fraud and other cases exposed the risks of my country's medical insurance operation and management. Every year, unnecessary expenditures caused by fraudulent insurance and unreasonable expenses have reached hundreds of millions yuan. The timely identification of medical insurance fraud and the stop loss and accountability have played a positive role in maximizing the social value of the medical insurance fund.

Digital China conducts medical insurance actuarial calculations based on the income, expenditure, and balance of the Shanghai Medical Insurance Fund. Among them, fund income is divided into overall funds and personal accounts, including current collection, financial subsidies, interest and other income. Fund income is affected by factors such as the insured population structure, macroeconomics, and payment base. Fund expenditures are mainly divided into medical expenditures and other expenditures. Medical expenditures account for the main part of the expenditures.

They are divided into three categories: general outpatient and emergency, outpatient serious illness and hospitalization. They are affected by the type of disease, the number of visits, and the average cost per visit, and are particularly affected by the demographic structure Impact, namely the impact of aging. Population is an important factor affecting the medical insurance fund, and the demographic factor is divided into insured persons on the job and retired persons. Digital China uses time series, population migration gravity model, age shift calculation model, etc. to make population forecasts; then it uses exponential smoothing model, Logistic block growth model, kernel density estimation, elastic network regression and other methods to predict the income and support of the fund. .

In response to medical insurance fraud, Digital China integrates fixed-point medical insurance settlement data and cost details, comprehensively analyzes doctors' diagnosis and treatment behavior, and identifies serious risk diagnosis and treatment items such as rehabilitation, physical therapy, and Chinese medicine treatment. And based on the number, frequency, and inter-item associations of medical treatment items prescribed by doctors, an early warning indicator system is recommended. Using unsupervised machine learning methods, doctors are divided into groups based on the characteristics of doctors' diagnosis and treatment behavior, forming a big data early warning model, and verifying the results. According to the verification results, determine the characteristics of the doctors, use AHP level analysis and other methods to score the doctor's doubts, and grade the scoring results according to high, middle and low. For Shanghai Medical Insurance, more than 1,000 suspected doctors were identified, and the cost of suspected points exceeded 14 million yuan. Among them, high-risk doctors accounted for about 20% of the total number of suspected doctors, and the costs of suspected points accounted for more than 60% of the total cost of suspected points.