DSA 8660 Group Project

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Contents

How does IT transform the healthcare sector?

Introduction

The 2017 Healthcare Information and Management Systems Society (HIMSS) Conference & Exhibition was one of the world's largest and most influential healthcare IT events. Held from February 19–23, 2017 at the Orange County Convention Center in Orlando, Florida, the event brought together over 40,000 healthcare and IT professionals, including clinicians, policymakers, researchers, tech executives, industry leaders & more. With more than 1200 exhibits and hundreds of educational sessions, HIMSS 2017 served as a dynamic forum for exploring the constantly growing convergence of healthcare and technology. Key themes included cybersecurity, patient engagement, tele-medicine, and deep/machine learning integration for assistive technology, highlighting the growing need for connected and trained systems that support a rapidly growing healthcare landscape.

Since the 2017 conference, groundbreaking technologies have emerged with the potential to alter how healthcare data is managed, analyzed, and protected. Among these, Deep Learning has shown exceptional promise in areas such as medical imaging, diagnostics, and clinical decision assistance - offering accuracy beyond normal practice. A growth in ethical tech like differential privacy - which enable the sharing and analysis of sensitive health data while preserving individual privacy — shows an increasing concern about earning user trust in the era of big data and personalized medicine. These innovations represent both technical progress and also a shift in how healthcare systems operates at massive scale while maintaining trust, security, and ethical responsibility.

One of the key enablers behind the rise of these advanced data technologies is the significant improvement in computing infrastructure - especially through the widespread adoption of Graphics Processing Units (GPUs). Technology like NVIDIA's CUDA have transformed GPUs from gaming hardware into essential tools for scientific computing, enabling massive parallel processing that powers modern AI and machine learning applications. As the cost of computing has decreased, high-performance tools—such as dedicated GPUs—have become more accessible and standardized, even in personal and enterprise-level systems. This democratization of computing power has allowed a broader range of researchers, developers, and healthcare organizations to experiment with and deploy data-intensive solutions that were once limited to well-funded labs or tech giants.

The focus areas of HIMSS 2017 and the emergence of next-generation information technologies point toward a radical shift for the healthcare sector. As artificial intelligence, improvements in patient privacy, and scalable data infrastructure get better, they allow the possibility of data-driven personalized care. Our report explores how these technologies are driving change across the healthcare sector - from hospital workflows and patient experience, to large-scale population health management. By analyzing data sets from HIMSS 2017, we will begin to understand how convergence of healthcare and technology is redefining the foundations of patient care.

```
# loading datasets
HAEntity <- read.csv("data/HAEntity.csv")
head(HAEntity)
```

```
##   HAEntityId SurveyId ParentId UniqueId  EntityNo
## 1     856165    56048   856162    44570 100067299
## 2     856166    56048   856162    27264     24193
## 3     856168    56048   856162    27265     24195
## 4     856169    56048   856162    27251 100051340
## 5     856170    56048   856162    27252 100051341
## 6     856171    56048   856162    27260 100059711
##                                            Name HAEntityTypeId HAEntityType
## 1 Behavioral Health at Marietta Memorial Hospital              2    Sub-Acute
## 2                      The Rehabilitation Center              2    Sub-Acute
## 3                     The Strecker Cancer Center              3   Ambulatory
## 4           Marietta Health Care Physicians, Inc.             3   Ambulatory
## 5      Wayne Street Medical Campus - Primary Care             3   Ambulatory
## 6         Marietta Hospital Belpre Medical Campus             3   Ambulatory
##                                CBSA MedicareNumber           Address1
## 1 Parkersburg-Marietta-Vienna, WV-OH                401 Matthew Street
## 2 Parkersburg-Marietta-Vienna, WV-OH               1106 Colegate Drive
## 3 Parkersburg-Marietta-Vienna, WV-OH                401 Matthew Street
## 4 Parkersburg-Marietta-Vienna, WV-OH                400 Matthew Street
## 5 Parkersburg-Marietta-Vienna, WV-OH                  802 Wayne Street
## 6 Parkersburg-Marietta-Vienna, WV-OH                     125 Lee Street
##     Address2     City State   Zip      Phone Website Fax EmailConvention
## 1 Division H Marietta    OH 45750 7403741501          NA
## 2  1st Floor Marietta    OH 45750 7403741464          NA
## 3    Level G Marietta    OH 45750 7403765000          NA
## 4            Marietta    OH 45750 7403744500          NA
## 5  Suite 200 Marietta    OH 45750 7405684190          NA
## 6              Belpre    OH 45714 7404239640          NA
##   ProfitStatus ServicePopulation                        Type YearOpened
## 1                             NA           Behavioral Health         NA
## 2                             NA              Rehabilitation       1993
## 3                             NA                    Oncology       1993
## 4                             NA             Family Practice       1995
## 5                             NA             Family Practice       1995
## 6                             NA Internal Medicine, Pediatric         NA
##   OwnershipStatus NofFTE VendorSelStrategy NofBeds NofStaffedBeds FreeStanding
## 1           Owned     NA                       13             13        False
## 2           Owned     NA                       17             17        False
## 3           Owned     NA                       NA             NA        False
## 4           Owned     NA                       NA             NA        False
## 5           Owned     NA                       NA             NA        False
## 6           Owned     NA                       NA             NA        False
```

```
##   SameISSystem AcuteId NofPhysicians NofHCareVisits FTETotal DataCenterAcuteId
## 1         True  856163            NA             NA       NA                NA
## 2         True  856164            NA             NA       NA                NA
## 3        False      NA             4             NA       NA                NA
## 4        False      NA             1             NA       NA                NA
## 5        False      NA             3             NA       NA                NA
## 6        False      NA             1             NA       NA                NA
##   PhysFT PhysAffiliated PhysTotal IsImaging PhysResidents PhysHospitalists
## 1     NA             NA        NA     False            NA               NA
## 2     NA             NA        NA     False            NA               NA
## 3     NA             NA        NA     False            NA               NA
## 4     NA             NA        NA     False            NA               NA
## 5     NA             NA        NA     False            NA               NA
## 6     NA             NA        NA     False            NA               NA
##   PhysOther NofIntensiveCareBeds AverageDailyCensus Latitude Longitude
## 1        NA                   NA                 NA 39.43069 -81.46479
## 2        NA                   NA                 NA 39.43888 -81.44446
## 3        NA                   NA                 NA 39.43132 -81.46489
## 4        NA                   NA                 NA 39.43125 -81.46483
## 5        NA                   NA                 NA 39.41248 -81.43749
## 6        NA                   NA                 NA 39.27217 -81.58209
##   IsIDSACOClassified IsIDSPCMHCertified IsIDSPlanningACO IsIDSPlanningPCMH
## 1              False               False            False             False
## 2              False               False            False             False
## 3              False               False            False             False
## 4              False               False            False             False
## 5              False               False            False             False
## 6              False               False            False             False
##   NoOfNeonatalIntensiveCareBeds PhysicianExtenders PercVirtServers
## 1                            NA                 NA              NA
## 2                            NA                 NA              NA
## 3                            NA                  0              NA
## 4                            NA                  0              NA
## 5                            NA                  0              NA
## 6                            NA                  1              NA
##   PercVirtComputers     County DisasterMsgId IsNICUPresent
## 1                NA Washington            NA         False
## 2                NA Washington            NA         False
## 3                NA Washington            NA         False
## 4                NA Washington            NA         False
## 5                NA Washington            NA         False
## 6                NA Washington            NA         False
```

```r
# summary(HAEntity)

Pharma <- read.csv("data/Pharmacy.csv")
head(Pharma)
```

```
##       Id SurveyId HAEntityId   ADM ADMPlanned ADMTimeFrame ADMPerc Robot
## 1 100262    56424     862656 False      False          NA      NA False
## 2 101535    56797     878405 False      False          NA      NA False
## 3 102373    57094     887601 False      False          NA      NA False
## 4 102376    57094     887604 False      False          NA      NA False
## 5 102382    57094     887610 False      False          NA      NA False
```

```
## 6 102365    57094     887593 False      False                   NA False
##   RobotPlanned RobotTimeFrame DeptMedical DeptED DeptOR DeptOther DeptOtherName
## 1        False                       False  False  False     False
## 2        False                       False  False  False     False
## 3        False                       False  False  False     False
## 4        False                       False  False  False     False
## 5        False                       False  False  False     False
## 6        False                       False  False  False     False
##   EMAR_CPOE CarouselsTimeFrame CarouselsPlanned Carousels InventoryMgmt
## 1        NA                              False     False          1378
## 2        NA                              False     False          1380
## 3        NA                              False     False          1379
## 4        NA                              False     False          1379
## 5        NA                              False     False          1379
## 6        NA                              False     False          1379
##   PharmaceuticalSupplyVendorID PharmaceuticalSupplyVendorName
## 1                           NA
## 2                           NA
## 3                           NA
## 4                           NA
## 5                           NA
## 6                           NA
```

```
HA_NPI <- read.csv("data/HAEntityNPI.csv")
head(HA_NPI)
```

```
##      id SurveyId HAEntityId NPI_Number ServiceType
## 1 79358    56284     860668 1144221847    Hospital
## 2 80852    56664     871616 1881613909    Hospital
## 3 80853    56664     871616 1699819003    Hospital
## 4 79851    56481     865011 1982047908    Hospital
## 5 79852    56481     865011 1962795120    Hospital
## 6 79614    56424     862656 1255406369    Hospital
```

Datasets

1. HAEntity:
    - Description: This table contains the demographic information for all the facilities and systems tracked in the database. (This is a self referencing table).
    - Link: This table links to the other tables by the HAEntityID. This table also links to itself by HAEntityID to ParentID. The table linked by HAEntityID will pull the IDS information and the table linked by ParentID will pull the facility information.
2. Pharmacy:
    - Description: This tables provides an overview of the pharmacy department, including FDA bar code regulations, use and planned ADMS, Robots, and EMARs.
    - Link: This table links to the other tables by the HAEntity$HAEntityID.
3. HA_NPI
    - Description: This table provides information reguarding medication prescriber's NPI (National Provider Identifier).

- Link: This table is connected to HAEntity by SurveyId and HAEntityID.