The era of cognitive computing
IBM Watson
Technology Trends… cognitive computing is here

Cloud

Cognitive computing

Big Data

Ubiquitous computing

Programmatic computing
Cognitive computing

Search ➔ Discovery
Deterministic ➔ Probabilistic
Enterprise data ➔ Big Data
Machine language ➔ Natural language
Simple outputs ➔ Intelligent options

- Touch
- Sight
- Hearing
- Taste
- Smell
What if an enterprise had all the answers it needs to succeed?

Imagine a system which does not just provide access to information for us, but instead directly give us an answer to our question?!

On February 14, 2011, IBM Watson changed history introducing a system that rivaled a human’s ability to answer questions posed in natural language with speed, accuracy and confidence.
How to build a cognitive system like Watson

1. Understands natural language and human speech

2. Generates and evaluates hypothesis for better outcomes

3. Adapts and learns from user selections and responses

...connect the dots and deliver knowledge out of data through advanced analytics
How does Watson work?

“In May 1898 Portugal celebrated the 400th anniversary of this explorer’s arrival in India”

Analyze question → Generate hypothesis → Collect and evaluate evidence → Weigh and combine for final confidence

“Vasco da Gama”

Learn from right/wrong answer

Domain Data  Learned Models

Read
OUTPATIENT PROGRESS RECORD

NAME: SMITH, JANE
MRN: 056863
DATE: 02/23/2014
ATTENDING: DAVID STONE, MD

INITIAL CONSULTATION

CHIEF COMPLAINT: This is a 65-year-old female with a history of a new, firm mass in the breast and possible adjuvant treatment options.

HISTORY OF PRESENT ILLNESS: The patient reported a lump in the left breast. On 12/10/13, she underwent a bilateral mammogram, which revealed the presence of a 1.7 cm mass at the 2 o'clock position. The left mammogram and ultrasound on 12/19/13 confirmed the findings.

On 1/14/14, the patient underwent an ultrasound-guided biopsy of the left breast, which was consistent with poorly differentiated invasive ductal carcinoma.

On 1/25/14, the patient underwent a left lumpectomy and sentinel node biopsy. Pathology revealed invasive ductal carcinoma, spanning 3.6 cm and involving 1/3 of the breast. There was no evidence of lymphovascular invasion or coagulative necrosis. IHC staining revealed no positive cells for estrogen receptor or progesterone receptor. The sentinel lymph nodes were positive for metastatic cancer.

Given these findings, the patient was referred to a surgeon today for further evaluation of her surgery. She has continued to heal relatively well, with a 10-pound weight loss over the last year secondary to dietary modifications and increased exercise.

PAST MEDICAL HISTORY: 1) Diabetes mellitus, type 2, with poor glycemic control and a long history of transient peripheral neuropathy, which progressed to retinopathy and nephropathy. 2) High cholesterol.

PAST SURGICAL HISTORY: Tonsillectomy.

ALLERGIES: No known drug allergies but is ALLERGIC to shellfish.

MEDICATIONS: Lipitor 20mg daily, multivitamin.

GYN HISTORY: Menarche at age 13. Last menstrual period was in 2001. She is G1P1. She used oral contraceptive pills for 10 years in her 20s. She denies history of hormone replacement therapy or fertility treatment.

SOCIAL HISTORY: The patient is of Irish background. She works as a high school teacher and lives with her husband in New York. She is a never smoker and drinks approximately 3 glasses of wine a week.

FAMILY HISTORY: There is no known family history for breast or ovarian carcinoma. The patient's mother is alive at age 88 with hypertension and gout. The patient's father is alive and was diagnosed with Stage III colon cancer at age 82, status post resection and systemic chemotherapy. One brother died at 62 of complications from a stroke. She has four living siblings, with no history of malignancies. Her maternal grandmother had a history of leukemia diagnosed at age 49. The patient has one daughter, age 51, who is healthy.

HEALTH MAINTENANCE: Last Pap smear in 08/2013, unremarkable. Colonoscopy conducted four years ago, and a DEXA bone mineral density scan conducted several years ago. She is unclear of the exact dates but recalls the results being normal.

PHYSICAL EXAMINATION:

GENERAL: Well-appearing woman in no apparent acute distress.

VITAL SIGNS: BP 120/70, P 80, T 36.9, WT 78.5 kg, HT 168 cm.

HEAD/NECK: Anicteric sclerae. No thyromegaly. No JVD.

NODES: No cervical, supraclavicular, or inguinal lymphadenopathy.

HEART: S1 and S2, regular rate and rhythm.

LUNGS: Clear to auscultation and percussion.

ABDOMEN: Soft, nontender, with normal bowel sounds. No hepatosplenomegaly or masses.

BREASTS: No masses are palpable, bilaterally. Left breast lumpectomy scar is well healed.

EXTREMITIES: No clubbing, cyanosis, or edema.

NEURO: Alert and oriented x3. Nonfocal with no deficits.

SKIN: No rashes appreciable.
## Breast Cancer | Clinical Information

### Patient Information
- **Age**: 65 years old
- **Performance status (ECOG)**: Information Needed
- **Menopausal status**: postmenopausal

### Staging
- **M Category**: M0
- **pT Category**: T1c
- **pN Category**: N0

### Prior Treatments
- **Prior surgical resection**: lumpectomy
- **Lymph nodes evaluated**: yes

### Tumor Characteristics
- **Histology**: ductal
- **Grade**: poorly differentiated
- **Estrogen receptor status**: positive
- **Progestrone receptor status**: positive

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### Treatment Plan Options

Provide clinical information on the left in the highlighted areas.
NCCN guidelines state as follows: "NCCN believes that the best management for any cancer patient is in a clinical trial. Participation in clinical trials is especially encouraged."

**Chemotherapy and Referral to Radiation Oncology followed by Endocrine Therapy**

**Timeline for Treatment Plan**

<table>
<thead>
<tr>
<th>Chemotherapy</th>
<th>Radiation</th>
<th>Endocrine</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMF (cyclophosphamide/methotrexate/fluorouracil)</td>
<td>Referral to radiation oncology</td>
<td>Aromatase inhibitor (anastrozole) at least 5 years</td>
</tr>
<tr>
<td>TC (docetaxel/cyclophosphamide)</td>
<td></td>
<td>Aromatase inhibitor (exemestane) at least 5 years</td>
</tr>
<tr>
<td>Dose-dense AC (doxorubicin/cyclophosphamide) followed by weekly paclitaxel</td>
<td></td>
<td>Aromatase inhibitor (letrozole) at least 5 years</td>
</tr>
<tr>
<td>AC (doxorubicin/cyclophosphamide)</td>
<td></td>
<td>Tamoxifen at least 5 years</td>
</tr>
</tbody>
</table>
Chemotherapy and Referral to Radiation Oncology followed by Endocrine Therapy

Details for CMF (cyclophosphamide/methotrexate/fluorouracil)

Rationale

Tamoxifen and chemotherapy for lymph node-negative, estrogen receptor-positive breast cancer.

Relevance:
Strength:


Tamoxifen and chemotherapy for lymph node-negative, estrogen receptor-positive breast cancer.


Purpose: The B-20 study of the National Surgical Adjuvant Breast and Bowel Project (NSABP) was conducted to determine whether chemotherapy plus tamoxifen would be of greater benefit than tamoxifen alone in the treatment of patients with axillary lymph node-negative, estrogen receptor-positive breast cancer.

Methods: Eligible patients (n = 2308) were randomly assigned to one of three treatment groups following surgery. A total of 771 patients with follow-up data received tamoxifen alone; 767 received methotrexate, fluorouracil, and tamoxifen (MFT); and 768 received cyclophosphamide, methotrexate, fluorouracil, and tamoxifen (CMFT). The Kaplan-Meier method was used to estimate disease-free survival, distant disease-free survival, and survival. Reported P values are two-sided.

Results: Through 5 years of follow-up, chemotherapy plus tamoxifen resulted in significantly better disease-free survival than tamoxifen alone (90% for MFT versus 85% for tamoxifen [P = .01]; 89% for CMFT versus 85% for tamoxifen [P = .001]). A similar benefit was observed in both distant disease-free survival (92% for MFT versus 87% for tamoxifen [P = .008]; 91% for CMFT versus 87% for tamoxifen [P = .006]) and survival (97% for MFT versus 94% for tamoxifen [P = .05]; 96% for CMFT versus 94% for tamoxifen [P = .03]). Compared with tamoxifen alone, MFT and CMFT reduced the risk of ipsilateral breast tumor recurrence after lumpectomy and the risk of recurrence at other local, regional, and distant sites.

Risk of treatment failure was reduced after both types of chemotherapy, regardless of tumor size, tumor estrogen or progesterone receptor level, or patient age; however, the reduction was greatest in patients aged 40 years or less. No subgroup of patients evaluated in this study failed to benefit from chemotherapy.
A cognitive system can advise us on your documents

Joseph: I received a notification suggesting to back my phone up on a cloud. What does that mean?

Watson: A cloud is a remote site accessible from the Internet instead of locally on your computer. Backing data up on the cloud encrypts your information, and allows you to access it from any location.

Melissa: What are prices like near me?

Watson: The average price of a home in Austin Texas is $217,700.

Melissa: How about financing?
e.g. in a bank
Watson: Hi Joseph... how is the new iPhone?

Joseph: I really like the new iPhone and I enjoy watching ESPN on it. I am travelling next week. Is my data plan valid in Puerto Rico?

Watson: Coverage is only available in specific cities in Puerto Rico. Which city in Puerto Rico?

Joseph: Yes, San Juan.

Watson: Yes, your 3G data services are covered in Bayamon, Carolina and San Juan cities of Puerto Rico.

Joseph: Thanks, that is very helpful.

Watson: For world travelers we offer the $20/month plan that gives you 2 GB of data usage in over 130 countries.

Joseph: Is it valid in Dominican Republic?

Watson: Yes it is.
What cancer therapies inhibit the FLT3 mutation?

**Evidence (All)**

- **Source of evidence**: 12,398 total documents
  - 3,099 Journals
  - 1,240 Textbooks
  - 744 Trials
  - 1,860 Standards
  - 4,339 Abstracts
  - 1,116 Patents

**Similar exploration by**
- Ashley Hathaway
- Joshua Dillard
- Bradley Becker
- Maya Weinstein

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"... *Sorafenib* has been reported to show significant activity against Flt3-ITD positive acute myelogenous leukemia. *Sunitinib* also inhibits Flt3 ..."

Article title: CD135 | Source Type: Journal Article | Date: January 2009

"... In addition *sunitinib* inhibits other RTKs. These include: RET, CSF-1R, flt3, ..."

Article title: Sunitinib | Source Type: Journal Article | Date: January 2009

"... *SGX523* (SGX Pharmaceuticals) specifically inhibits MET at low nano molar concentrations. *MP470* (SuperGen) is a novel inhibitor of c-KIT, MET, PDGFR, Flt3, and AXL. ..."

Article title: C-Met | Source Type: Journal Article | Date: October 2004

"... Specifically Quizartinib selectively inhibits class III receptor tyrosine kinases including FMS-related tyrosine kinase 3 (FLT3/STK1), colony-stimulating factor 1 receptor (CSF-1R/FMS), stem cell factor receptor (SCFR/KIT), and platelet derived growth factor receptors (PDGFRs) ..."

* User experience is not final
Watson Ecosystem

Build apps

Provide skills

Provide content

Watson Developer Cloud

Watson Platform & Tools

Watson Content Store

Enhance client experience
Bali, Ibiza, and Tamarindo are the recommended destinations for you and your family. If you think of anything else you want on your vacation, enter it below to update your recommendations!

We love the beach, but we also want some adventure time on dry land.

Sure. Punta Cana, Cabo San Lucas, and Hanalei Bay are destinations you'll love if you want dry land adventure too.

Activities abound, not only scuba diving but snorkeling, windsurfing, kayaking, water biking, sailing, beach volleyball or soccer, even water polo, along with aqua aerobics and tons of children's activities. - Frommer's

There are plenty of guided tours — safaris to sugar cane plantations; excursions to the capital, Santo Domingo; catamaran rides to offshore islands, and whale-watching trips in Samana Bay during the mating season. - REI Travel

It wouldn't be out of line to equate the eastern coast of the Dominican Republic as a sort of sea and sun Disneyland - after all, it is here where the megalomaniacal all-inclusive resorts snatch up broad swaths of cinematic beaches faster than the real estate agents can get the sun-soaked sands on the market. Its beaches rival those anywhere else in the Caribbean, both in terms of their soft, white texture and their warm aquamarine waters.
I'm gearing up for a 14 day backpacking trip. What equipment do I need?
Can you tell me more about ABS Technology?
I like the Prophet 65. How is it rated?

The best innovations are born from experience. The North Face athletes are constantly pushing limits on the world's most challenging terrain.

Originally designed to meet the demands of hardworking ski patrollers, ABS system integrated for quick deployment in emergency situations. This pack includes an activation pull handle within each reach that deploy an air canister to expose two integrated, high-volume airbags that keep you on the surface of the avalanche and speeds rescue due to visibility of the airbags.
Take the next step to harness the power of cognitive systems

- Where could your data work harder for you?
- Where are you forced to conform to computers rather than vice versa?
- How can you use big data and analytics TODAY to lay the groundwork?